A

SYSTEM OF SURGERY,

By BENJAMIN BELL.

VOLUME SIXTH AND LAST.

[Price Six Shillings and Six Pence in boards.]


BRITISH MUSEUM

A

SYSTEM

OF

SURGERY.

BY

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BRITISH MUSEUM

THIS and the preceding Volumes comprehend the Syſtem of Surgery which I had undertaken to publiſh.

To a candid Public I am under great obligations. My labours have met with a reception more favourable than I expected, and more flattering than they ſeem to me to merit.

DIFFERENT editions have already been publiſhed of the preceding volumes. If the Work, now that it is finiſhed, continues to have a ſimilar reception, no attention ſhall be wanting on my part to render it as complete as may be: I mean to inſert in every edition to which it may extend, whatever improvements future experience may add to our ſtock of chirurgical knowledge.

FOR this purpoſe, I have already requeſted the favour of my friends in dif-

ferent parts of the world, to give me early intelligence of every improvement with which they may become acquainted; and I take this method of ſoliciting the ſame kind of aſſiſtance from others. In this manner, I ſhall be enabled to render the work more perfect than I otherwiſe could do; at the ſame time that improvements may thus be preſerved which otherwiſe might be loſt.

To the purchaſers of the firſt editions, I think it a piece of juſtice to obſerve, that their intereſt ſhall not be affected, by any improvements that may be inſerted in any ſubſequent edition; for whenever the alterations are of much importance, the Bookſellers, both here and elſewhere, ſhall be deſired to ſell them ſeparate from the reſt of the Work.

BENJAMIN BELL.

EDIN. May 1788.

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A

TREATISE

ON THE

THEORY AND PRACTICE

OF

SURGERY.

CHAPTER XXXIX.

Of Fractures.

SECTION I.

General Obſervations on Fractures.

SOME practitioners denominate every ſolution of continuity in a bone a Fracture; but the term may, with more propriety, be confined to thoſe diviſions in bones which are produced by external violence. Thus, we do not

ſay that a bone is fractured, the parts of which are ſeparated from each other by the effect of any internal diſorder; while we ſay that it is fractured when this happens from a fall, a blow, or a bruiſe.

Fractures are of various kinds, and are diſtinguiſhed by different names. A bone may be fractured either directly acroſs, in an oblique direction, or longitudinally: Hence the terms, Tranſverſe, Oblique, and Longitudinal Fractures. When a bone is ſplit into ſmall pieces, we call it a Splintered Fracture.

When the teguments remain ſound, a fracture of a bone is denominated Simple; and we term it Compound when the fracture communicates with a wound in the ſkin, and other correſponding ſoft parts. By ſome a fracture is ſaid to be Compound when a bone is broke into different parts; and thoſe fractures they term Complicated, which are accompanied with wounds in the correſponding ſoft parts. This ſubdiviſion, however, of fractures, ſeems to

to be unneceſſary: for unleſs a bone is ſplintered, no eſſential difference ariſes merely from its being broke at one or two parts; whereas the ſlighteſt communication between a fracture and a wound in the ſurrounding ſoft parts, is apt to change the nature of it ſo entirely, as to induce danger, and even death, in caſes where no alarming ſymptoms would otherwiſe have been dreaded.

The exiſtence of fracture is, for the moſt part, eaſily diſcovered by manual examination. A fracture of a ſingle bone, where there is only one in the fractured part of a limb, and the fracture of both bones when there are two, as well as a fracture accompanied with an extenſive wound of the contiguous ſoft parts, are eaſily detected: But in ſimple fractures, where only one bone of a limb has ſuffered, it is often difficult to judge with any degree of preciſion; and more particularly ſo where the contiguous parts have become tenſe and painful before a practitioner is called. In ſuch caſes, our opinion muſt be formed by a

minute attention to different circumſtances: The age and habit of body of the patient; the ſite of the ſuppoſed fracture; the ſituation of the limb when the injury was received; and, laſtly, to the attending ſymptoms.

In old people, bones are fractured more eaſily than in thoſe who are at an earlier period of life. In infancy, bones will rather yield than break upon the application of a moderate force; whilſt in old age they become ſo brittle, that the largeſt in the body are frequently broke upon the moſt trifling falls and bruiſes.

Different diſeaſes induce this brittle ſtate of the bones, particularly the lues venerea. Of this I have met with ſeveral inſtances. In two caſes, the largeſt and hardeſt bones were broke ſolely by the ordinary action of the muſcles of the limb. It is alſo the effect of the ſea-ſcurvy: bones that have been fractured and long united having been frequently ſeparated in advanced ſtages of the real ſcurvy, the callus being either diſſolved

or

or rendered too ſoft for the purpoſe of retaining them together.

Beſides theſe general affections of the body, the bones themſelves are liable to a diſeaſe which renders them ſoft and flexible. It is uſually termed Mollities Oſſium. In ſome caſes, it goes no further than to produce that ſtate of the bones we have mentioned, in which they are apt to be fractured by ſlight falls, and other ſimilar accidents: But in others, it has been known to proceed to ſuch a height, that every bone in the body has become crooked and diſtorted. I have ſeen a ſkeleton in which the condyles of the knee-joints were turned up to the pubes, and in which every other bone was crooked in nearly a ſimilar degree.

In judging therefore of the probability of a fracture from the degree of violence applied, theſe circumſtances deſerve particular attention: For it is evident, that in old age, and in the diſeaſed ſtates of bones we have mentioned, a degree of force will occaſion fracture, which in

other ſituations would not be equal to this effect.

The ſite of a ſuppoſed fracture is alſo to be taken into conſideration. Bones are more apt to be broke in thoſe places where they are hard and brittle, as in the firmer parts of all the long bones, than towards their extremities, where they are of a more ſoft and yielding texture; and bones that lie deep under the cover and protection of muſcular parts, as in the thighs, are not ſo frequently fractured as thoſe of the arms and legs that are not ſo well protected.

Further, the ſituation of a limb when an injury is inflicted, is an object of inquiry. Thus, a very inconſiderable weight paſſing over a bone lying on an unequal ſurface, will readily produce a fracture; while the ſame bone, equally ſupported, will bear a heavy load without being injured.

In forming an opinion of the probability of a fracture having taken place, we ought, laſtly, to take into conſideration the ſymptoms which uſually accompany frac-

fracture. Theſe are, pain, ſwelling, and tenſion in the contiguous parts; a more or leſs crooked and diſtorted ſtate of the limb; a crackling or grating noiſe on the parts being handled; and loſs of power to a certain extent in the injured limb.

It is true, that the mere fracture of a bone is not neceſſarily attended with much pain; for the bones, not being ſo plentifully ſupplied with nerves as the ſofter parts of the body, they are therefore of a leſs irritable nature. But pain ariſes from two circumſtances with which fractures are uſually attended; the contiguous ſoft parts being bruiſed and otherwiſe hurt, in the firſt place by the force producing the injury, and afterwards by the diſplaced ends of the bones. For the moſt part the pain indeed is not very ſevere: but in ſome caſes it becomes ſo violent as to be productive of the moſt alarming ſymptoms; ſpaſmodic affections of the muſcles in the injured limb; high degrees of inflammation; fever, accompanied with ſubſultus tendinum; general

convulſions and delirium; and if the cauſe by which theſe ſymptoms were induced be not ſoon obviated, they very commonly terminate in the death of the patient. In general this is preceded by mortification of the parts contiguous to the fracture; but in ſome inſtances, affections of this kind prove fatal from the violence of the fever, and without any tendency to gangrene being perceptible.

When the force by which a fracture is produced has been extenſively applied over a limb, we may readily ſuppoſe that the ſevereſt ſymptoms may be induced by this cauſe alone; but in general it will be found, when the pain, tenſion, and convulſive twitchings of the muſcles are violent, that they chiefly originate from the adjoining membranes, muſcles, or other ſoft parts being lacerated, punctured, or compreſſed by the ends of the fractured bones: And although this may happen in fractures of every deſcription, yet it will neceſſarily be a more frequent occurrence in thoſe that are ſo oblique as to admit of the bones paſſing eaſily

over

over each other, than in tranſverſe fractures, where the parts, on being replaced, more readily remain in their natural ſituation.

The other diagnoſtic ſymptoms of fracture we enumerated, a grating noiſe on the parts being handled, and diſtortion and loſs of power to a certain extent in the injured limb, will be found on a minute examination to accompany almoſt every accident of this kind. They will indeed be much more evident in ſome fractures than in others: but in all they may be diſcovered where the parts are not much ſwelled, excepting in the caſe of a longitudinal fracture. A bone may indeed be ſplit in this direction without any of theſe ſymptoms taking place: for unleſs the divided parts be completely ſeparated from each other, neither diſtortion nor crackling will be perceived on handling them; nor will the bone be rendered incapable of ſuſtaining thoſe parts of the body which uſually reſt on it. In ſuch caſes, we judge of the probability of a fracture having

having happened, from the violence of the injury, the ſeverity of the ſymptoms, and other circumſtances already enumerated.

Beſides theſe leading ſymptoms of fractures which take place immediately on the injury being inflicted, there are others which occaſionally occur from the firſt, and ſome which we are to conſider as conſequences rather than ſymptoms. Of the firſt, the moſt remarkable are, that great degree of ecchymoſis which in ſome caſes appears inſtantaneouſly, from the ends of the fractured bones having penetrated a contiguous artery or vein; and the wound or laceration of the teguments in compound fractures.

The moſt important conſequences of fractures are, ſtiffneſs and immobility of the injured limb; diſtortion of the parts chiefly affected, either from a fulneſs or thickneſs remaining in the contiguous muſcles or ligaments; an exuberancy of callus; a contracted ſtate of the contiguous joints; or a maraſmus or waſting of

of the limb itſelf. All theſe we ſhall conſider more particularly when we come to ſpeak of the treatment of fractures.

In judging of a fracture, and the probable event of it, various circumſtances are to be conſidered: particularly the age and habit of body of the patient; the ſituation of the bone, and the part of it that is injured; the nature of the attending ſymptoms; the circumſtances with which the fracture may be complicated; and the kind of fracture.

With reſpect to the firſt of theſe, namely, the age and habit of body of the patient, we all know that they are points of much importance in the cure of every injury to which the human body is liable; and in none more than in fractures. Thus in youth, particularly in infancy, fractures in general cure much more quickly than in old age; and in ſound healthy conſtitutions, much more readily than in ſuch as are diſeaſed. We have obſerved above, that the bones are

apt

apt to become very brittle in lues venerea; and it may here be remarked, that the exiſtence of that diſeaſe, or of ſcurvy, is found to be particularly adverſe to the reunion of fractured parts. I have met with ſome exceptions to this, where fractures have been eaſily cured even in advanced ſtages of the lues venerea: but there is much reaſon to think that this is not a common occurrence; and that where this diſeaſe has attacked the bones, no callus will form till the virus be eradicated.

In ſpeaking of the effect of age on the cure of fractures, although I admit that the divided parts of bones unite more ſpeedily in infancy than in old age, yet I think it right to remark, that it does not appear to happen with more certainty. By many we are told, that in advanced periods of life the union of fractured bones is often not to be accompliſhed. I have never, however, ſeen an inſtance of this, although I have

had the management of many fractures even in extreme old age.

The ſituation and part of the bone that is injured are both circumſtances requiring attention. Thus we know, that fractures of the ſmall bones of the arms and legs, of the feet and hands, and of the ribs, in general heal quickly and eaſily; while fractures of the larger bones, particularly of the femur and humerus, are managed with much more difficulty. In the laſt, indeed, one principal cauſe of the cure proving for the moſt part very tedious, is the difficulty of retaining the ends of the fractured bones together. But whatever the cauſe may be, it will neceſſarily have the ſame effect on our prognoſis.

When any of the large bones are fractured near to their extremities, we find the danger to be much greater, and the proſpect of a complete cure much leſs, than when they are broke near to their middle: For here the ſhortneſs of one end of the bone makes the retention of

it

it difficult; and the ſymptoms which enſue from a fracture in this ſituation are apt to be particularly ſevere, not only from the contiguity of the capſular ligaments of the joints, which may thus be injured, but from the numerous tendons inſerted into theſe parts of the bones; which may not only be lacerated and bruiſed, but even tore from their inſertions. Beſides, the ends of bones are not only ſoft, but even ſpongy or cellular in their texture: Hence fractures near the extremities of bones are more tedious in the cure, and give riſe to more troubleſome ſymptoms, than in the harder parts of them: for the fractured parts do not here unite with ſuch equality; they more frequently exfoliate, and matter is more apt to form in them.

It is alſo proper to remark, that fractures near the extremities of bones are frequently productive of ſtiff immoveable joints, unweildy limbs, pains and ſwellings; which, in various inſtances,

even under the beſt treatment, continue obſtinate for a great length of time, and in ſome caſes during the life of the patient.

We are in general led to ſuppoſe, that theſe conſequences are ſolely owing to miſmanagement, either on the part of the ſurgeon or of the patient. That in ſome caſes they are ſo, no perſon will deny. The ends of a fractured bone may be improperly placed from the firſt by the practitioner, or they may be afterwards miſplaced by the patient; and in either caſe we may readily imagine, that all the ſymptoms we have mentioned will take place. But in juſtice to the profeſſion, we muſt obſerve, that they are more frequently to be attributed to the ſituation and nature of the fracture than to any other cauſe. Nor is it ſurpriſing that it ſhould be ſo. When we conſider the various circumſtances with which a fracture is often accompanied; the degree of violence required to break a large bone; the ſevere contuſion of the contiguous ſoft parts which this muſt produce;

duce; and the laceration of nerves, muſcles, and ligaments, which muſt occur from the ſpiculæ of the fractured portions of bone; we ſhould rather be apt to ſuppoſe that they would be more frequently productive of troubleſome conſequences than we actually find to be the caſe.

In forming a judgment of the nature and probable event of fractures, the ſymptoms which take place merit particular attention. If the ſymptoms are moderate, when compared with the apparent degree of violence the parts have ſuffered, our prognoſis ſhould be proportionally favourable: But whenever the attending ſymptoms are ſevere, particularly if the pain be uncommonly violent, and the ſwelling and tenſion conſiderable, however trifling the force may have been by which the fracture was produced, the caſe will probably be difficult to manage and uncertain in the event. In ſuch circumſtances, therefore, even in what is uſually termed a Simple Fracture,

Fracture, our prognosis should be guarded.

The circumstances with which a fracture may be complicated are likewise of importance; and unless they are duly weighed, no accurate judgment can be formed of the event. The contiguous muscles and other soft parts may be severely contused; some of the ligaments and tendons of the injured part may be ruptured or even tore from their insertions; and the fracture may be combined with a dislocation of one or both of the contiguous joints. These accidents aggravate the danger in every case of fracture.

The last consideration on this subject respects the kind of fracture. The greatest difference is observed between the event of a simple and of a compound fracture. A great proportion of cases of simple fracture are of a mild nature from the first; and with very ordinary attention complete cures are obtained: But in compound fractures, the smallest external wound communicating with the

injury in the bone will often be productive of the greateſt danger. I do not mean to ſay that this happens in every caſe; on the contrary, we know that even the worſt caſes of compound fractures will, with proper attention, often terminate in the moſt favourable manner: But every practitioner much verſant in this branch of buſineſs will allow that this is not to be depended on; and that even under the beſt management ſuch caſes are ſo apt to go wrong, as to warrant the opinion we have given of them, and to render it proper in almoſt every inſtance to give a guarded prognoſis.

Authors lay down various indications for the cure of fractures; and theſe we are deſired to have ſtrictly in view: Namely, extenſion; counter extenſion; coaptation, or replacement of the fractured parts; deligation, in ſo far as is neceſſary for retaining them; poſition of the injured part; and prevention or removal of bad ſymptoms.

The

The ſubject, however, may be ſimplified, and the indications with propriety reſtricted to three: To replace the parts of the bone that have been moved from their natural ſituation; to retain them in this ſituation as long as may be neceſſary; and to obviate ſuch ſymptoms as may ſupervene during the cure.

In ſome few favourable caſes, where the bones are fractured directly acroſs, they are either not moved out of their natural ſituation, or the alteration is ſo inconſiderable that they are eaſily replaced. But when the bones of a limb are broken in an oblique direction, they are apt to paſs one another ſo as to produce much deformity and pain. The contiguous muſcles are thus ſeverely injured, and excited to violent action: Hence in all ſuch affections the malady is increaſed by every natural exertion either of the whole body or of the part more immediately injured; and nothing will remove it but an artificial replacement of the diſtorted bones.

To accompliſh this, various methods have been propoſed. In former times it was effected by much violence and force: by what was termed Extenſion and Counter Extenſion; but we now know that our purpoſe may be accompliſhed in an eaſier manner, with leſs pain to the patient, and leſs trouble to the operator.

As long as it was imagined that much force ought to be employed, the limb was extended by one or more aſſiſtants pulling at each end of it; and when this was not ſufficient to draw the bones into their natural ſituation, different machines were uſed for this purpoſe. The neceſſary force was in general applied while the limb was on the ſtretch; a circumſtance which added much to the difficulty of reducing the fractured parts of the bone: for in this manner all the contiguous muſcles were put into action; nor could the bones be replaced till this was overcome by the application of a ſuperior force. The miſchief which this would

would often produce, it is eaſier to imagine than to expreſs.

When it is conſidered, that in the reduction of a fractured bone the chief reſiſtance we meet with is the action of the neighbouring muſcles, the propriety of putting the limb into ſuch a poſture during the operation as favours the relaxation of the different muſcles connected with it, is ſo obvious, that we now reflect with ſurpriſe, that it was left to the practitioners of the preſent age to propoſe this meaſure. For, whatever may have been the ideas of a few individuals, it is certain, that till very lately it was the general practice to keep every limb in an extended poſition while any attempt was making to replace the fractured bones, and that it is chiefly to Mr Pott we owe the introduction of the contrary practice.

In the treatment of a fracture, if we take care to relax all the muſcles of the limb, it is ſurpriſing with what eaſe the ends of the bones may in general be re-

placed. When a limb is laid completely in this relaxed poſture, the ſurgeon will in moſt caſes be able to replace them without any aſſiſtance whatever: But when he does not ſucceed, a ſlight degree of extenſion may be employed, by the upper part of the limb being kept firm by one aſſiſtant with his hands placed between the fracture and the contiguous joint, while the under part of it is gently extended by another; care being ſtill taken, however, to keep the muſcles as much relaxed as poſſible.

As it is of the utmoſt importance in replacing the fractured parts of the bone to do it with exactneſs, the niceſt attention ſhould be paid to this part of the operation. Every inequality depending upon any portion of bone being diſplaced ſhould be removed, ſo as to render the injured part as ſimilar as poſſible to the correſponding ſound limb; which, for the purpoſe of a more attentive examination, ſhould be placed as near to it as

as the conveniency of the operator will permit.

The neceſſity of attention to this part of the treatment will appear from this, that when the fractured bones are not properly reduced at firſt, the limb muſt either remain always diſtorted, or it muſt be put right during a future ſtage of the treatment; when it will neceſſarily be done with more pain to the patient and more trouble and perplexity to the ſurgeon.

The bones being put right, our next object is to retain them in this ſituation as long as may be neceſſary. This we do by proper compreſſes and bandages, and by placing the limb in ſuch a ſtate of relaxation as will admit of its reſting with eaſe, and without being diſturbed, till the cure be completed. When we come to treat of fractures of particular parts, the poſture in which they ſhould be placed, and the bandages that appear to be beſt adapted to them, will be deſcribed. At preſent we may obſerve,

that no bandage ſhould be applied with more tightneſs than is neceſſary for retaining the bones in their ſituation; and that this may, for the moſt part, be eaſily effected, if the limb be kept in ſuch a poſture as to relax the various muſcles connected with it.

The time required for rendering the union of fractured bones ſufficiently firm, depends upon various circumſtances: Upon the ſize of the bone, and the weight which it has to ſupport; on the age and habit of body of the patient; and on the cure having proceeded with more or leſs interruption, from the limb having been kept more or leſs ſteadily in its ſituation, as well as from the attending ſymptoms of ſwelling, pain, and inflammation, having been mild or ſevere. In a healthy middle-aged patient, when no untoward ſymptoms have occurred, and when the injured parts have been retained exactly in their ſituation, a cure of a fractured femur, or of the bones of the leg, will be accompliſh-

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ed in two months; of the humerus and bones of the fore-arm, in ſix weeks; of the clavicles, ribs, and bones of the fingers and toes, hands and feet, in three weeks. In infancy and childhood, fractures in all theſe parts heal much more quickly; while in old age this uniting proceſs goes on more ſlowly, and therefore requires more time to accompliſh.

In ſimple fractures, to which theſe general obſervations more particularly apply, the pain, tenſion, and other ſymptoms, are in general moderate, and uſually ſubſide entirely in the courſe of a few days, if the bones be properly retained in their ſituation: but in ſome caſes, inſtead of diminiſhing, they become daily more violent, ſo as to be productive of much diſtreſs to the patient, as well as trouble and embarraſſment to the practitioner.

When the muſcles and other ſoft parts of the limb have not been much contuſed, there is perhaps no neceſſity for any appli-

application, with a view to the prevention either of pain or tenſion: but for the moſt part it is proper to guard againſt the violence of theſe ſymptoms, by the early uſe of ſome aſtringent applications, ſuch as, a ſolution of ſaccharum ſaturni, of crude ſal ammoniac, or ſpiritus Mindereri; and when theſe fail, by a free application of leeches over all the pained parts. Indeed, the practice of taking away blood by leeches proves in every caſe of this kind ſo beneficial, that I always adviſe it whenever the tenſion is in any degree conſiderable, or whenever the pain continues ſevere after the bones have been replaced. In every caſe of fracture, inflammation is the ſymptom which, in the firſt place, we have moſt reaſon to dread; and as nothing tends with ſuch certainty to prevent or remove it as local blood-letting, it ſhould never be omitted when the ſurrounding ſoft parts are much injured: Nor ſhould the practice be delayed after it appears to be

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in any degree neceſſary; for it proves always moſt effectual when employed ſoon after an injury has been inflicted.

Beſides the immediate advantage of relieving the pain in the injured part, nothing prevents with ſuch certainty the troubleſome conſequences of contuſion in caſes of fracture as the early application of leeches. Of theſe conſequences the moſt remarkable are, deep-ſeated abſceſſes, which in ſome inſtances form within the cavity of the bone itſelf, and in others in the ſurrounding cellular ſubſtance; long continued pains, reſembling rheumatic affections, ſtretching over the injured limb; a thickened enlarged ſtate of the perioſteum and other ſoft parts; a ſtiff contracted ſtate of the contiguous tendons; an exuberancy of callus; and an unwieldy ſtate of the whole member.

It is well known to all who are verſant in this branch of buſineſs, that all of theſe conſequences are apt to ſucceed to fractures accompanied with much contuſion;

tuſion: And nothing proves more perplexing to ſurgeons, or more diſtreſsful to patients: for when they are not ſoon removed, they are very apt to prove permanent; and for the moſt part they are attributed to ſome miſmanagement in the reduction of the fracture.

In many inſtances they no doubt ariſe from the extremities of the fractured bone not being properly replaced, or not retained with exactneſs afterwards: but they more frequently proceed from the inflammation which follows from contuſion. It is therefore evident, that early leeching can alone be uſeful. When ſwelling and pain in a fractured limb have continued long, the moſt effectual relief is obtained from frictions with emollient oils, and from warm bathing, particularly from a proper uſe of the waters of Buxton, Bath, and Barreges.

We are ſometimes diſappointed in obtaining complete cures of fractures, by the limbs remaining unſeemly from an over-growth of callus. It is not a com-

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mon occurrence; but every practitioner muſt have met with it. As far as I am able to judge, in fractures attended with much inflammation, where this inconveniency is moſt apt to occur, local blood-letting proves more uſeful than any other remedy in preventing it. In ſome caſes, however, the tendency to form callus is ſo great that it can ſcarcely be checked. The application of ardent ſpirits, and of other aſtringents, is here ſuppoſed to prove uſeful; and I have in ſome inſtances derived advantage from a continued gentle preſſure, which is beſt applied by means of a thin plate of lead adapted to the form of the part, and retained by a proper bandage: But as neither this nor any other remedy will prove ſucceſsful in every caſe, and as patients are apt to regret nothing ſo much as a diſappointment in obtaining a complete cure of a fracture, our ſafeſt courſe, as ſoon as the callus begins to be too luxuriant, is to acquaint the patient with the probable event; and he muſt be very

ry unreaſonable indeed, if he afterwards repines at what the utmoſt care and attention could not prevent.

Among the conſequences which ſometimes reſult from fractures, there is one which we muſt conſider more particularly; namely, a difficulty of obtaining an union between the ends of the fractured bones, by which they remain looſe and detached long after they ſhould have been firmly knitted together.

This may proceed from various cauſes: From ſome conſtitutional diſeaſe, ſuch as rickets, ſcurvy, or lues venerea; from the ends of the fractured bones not being kept ſteadily in contact till their complete reunion be accompliſhed; from a portion of a muſcle, tendon, or ligament, falling in between the ends of the fractured parts, ſo as to prevent them from being placed in contact; and in ſome caſes it proceeds from a bone being broke in different parts, and the intermediate detached pieces being ſo ſmall

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as to prevent them from adhering even when kept in close contact.

It has been observed, too, that occurrences of this kind happen more frequently during pregnancy than in other situations. This has not indeed fallen within my observation; but it appears to be the general opinion of practitioners, and different instances of it are recorded by authors.

When this want of union proceeds from any general disease of the system, those remedies must be employed which are known to prove most effectual in removing it: for no attention on the part of the surgeon will produce any advantage till this be accomplished; and as much mischief is often prevented by an early application of remedies, they should always be advised as soon as the cause is observed to exist. It would even be a proper precaution, where it is known that a patient at the time of receiving a fracture labours under any constitutional disorder, to advise such a course

courſe immediately; by which means cures might be accelerated, which otherwiſe would be unneceſſarily protracted.

When the union has been prevented by the fractured bones not having been kept ſteadily in a proper ſituation, the bones ſhould be replaced and retained in their ſituation with as much exactneſs as poſſible; and when the injury is ſtill recent, a perfect union may by this means be ſtill accompliſhed.

But where a fracture has continued long without any union being formed between the ends of the bones, the oſſeous matter by which they ſhould have been knit together becomes hard, ſmooth, and totally unfit for the purpoſe, in ſo much that no advantage could be derived from their being replaced. Of this I have met with different inſtances, where the ends of the fractured bones were become perfectly ſmooth, and moved on each other with the ſame eaſe and freedom as the bones of any of the

joints: and various caſes of it are to be met with in authors.

In this ſituation, when no great inconveniency is experienced, the patient ſhould be adviſed to ſubmit to it, particularly in fractures of the ſmall bones, ſuch as thoſe of the fingers and toes, the bones of the metacarpus and metatarſus, the clavicles, and ribs: but in the large bones of the extremities, where much firmneſs is required, and where any injury of this kind muſt be productive of almoſt a total loſs of the uſe of the limb, as we may be able by an operation to reſtore it, we ought perhaps in every inſtance to propoſe it. By making an inciſion through the ſurrounding ſoft parts, ſo as to lay the ends of the bones bare, and removing a ſmall portion of each of them either with a common ſaw or with the head of a trepan, we reduce them to the ſtate of a recent fracture; when, by taking care to retain them in a proper ſituation, we may in due time expect a complete cure.

The operation is no doubt painful and tedious: for the inciſion ſhould be extenſive in order to admit of a free application of the inſtruments; and for the moſt part it muſt be conducted with much caution, in order to avoid the large blood-veſſels of the limb: But it may be done with perfect ſafety by any perſon accuſtomed to the operative part of ſurgery *.

Nor ſhould we be deterred from propoſing this method of cure from any apprehenſion about the extent of the vacancy that may be produced by the removal of the ends of the bones: for if the limb be kept ſteadily in its ſituation, and if the conſtitution be healthy, nature will not probably fail in ſupplying the deficiency. Thus we have many inſtances upon record, even of entire bones being regenerated; and, in a leſſer degree, the powers of nature on this point

* Vide White's Caſes in Surgery, where two inſtances of this are recorded.

point muſt have fallen within the obſervation of every practitioner.

A bone is often broke in different parts, and a cure notwithſtanding obtained: but when the detached parts are ſo ſmall that the circulation will not probably be kept up in them, as they will thus be rendered incapable of furniſhing the ſecretion by which their reunion ſhould be accompliſhed, it would be better to remove them at once than to impede the cure by any attempt to ſave them. Accordingly, in all compound fractures, where the injured bone is already laid bare, it is the practice of our beſt ſurgeons to remove all ſuch detached portions as might not probably unite with the remaining parts of the bone. But in ſimple fractures, where the ſkin remains entire, as we cannot judge with ſuch certainty of the nature and extent of the injury, nor of the probability of our being able to preſerve all the looſe portions of bone, we endeavour in the firſt place to accompliſh a cure in the eaſieſt

manner, by placing the parts in ſuch a poſition as will moſt readily admit of their union being effected: but when this does not ſucceed, when the ends of the bone remain looſe long after they ſhould have been united, and one or more detached pieces are diſcovered, theſe are to be conſidered as extraneous bodies, and ought to be removed with the fingers or forceps, at an opening made through the ſoft parts for this purpoſe.

Experience enables me to recommend this method of treatment with confidence. I have met with different caſes, where a cure being conſidered as impracticable from no union having formed between the ends of fractured bones, was at laſt accompliſhed in the courſe of a very ſhort time by the removal of ſome looſe fragments.

But the moſt perplexing cauſe preventing the reunion of fractured bones, is a portion of a muſcle, ligament, or ſome other ſoft part paſſing between them. We judge that this is the caſe when the pain

pain and tenſion of the injured part have been more ſevere than uſual from the firſt; when particular movements of the limb occaſion ſevere pain and twitchings of the muſcles that ſerve to move it; and when the ends of the fractured bone do not unite at the uſual time.

As ſoon as there is any reaſon to think that a cure is prevented by the cauſe we have juſt mentioned, we ſhould endeavour to remove the portion of interpoſing membrane or muſcle, by putting the limb into all the variety of poſtures by which it will be moſt readily effected. But when this does not ſucceed, as will often be the caſe, and when the bones ſtill remain looſe long after the uſual period, we ought, without farther heſitation, to make an inciſion upon the fractured part. When the injury has not been of long duration, a cure will be accompliſhed merely by bringing the ends of the fractured bone into contact: But when this meaſure has been too long delayed, and when the oſſeous matter

poured out by the fractured extremities of the bone has become hard, a ſmall portion of it ſhould be removed either by a ſaw or with ſome ſharp inſtrument, ſo as to convert the injury once more into the ſtate of a recent fracture; otherwiſe no advantage will be gained by the operation.

Beſides theſe cauſes I have mentioned, which tend to impede the cure of a fractured bone, it may not be improper to remark, that the effuſion of much blood around the injured bone is very apt to be productive of the ſame effect. It is ſeldom, in caſes of ſimple fracture, that any of the larger blood-veſſels are injured; and blood effuſed from ſmall arteries is for the moſt part ſoon abſorbed, and no bad effects reſult from it. But inſtances ſometimes occur even in ſimple fractures, of a large blood-veſſel being cut by the ſharp ſpiculæ of bone. When the quantity of blood thrown out is conſiderable, the tumefaction of the limb becomes ſo great, that it is neceſſary to

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lay it open in order to ſecure the divided veſſel with a ligature: but where the ſwelling does not arrive at any alarming height, we rather truſt to the natural contractility of the artery for ſtopping the hemorrhagy, and to the powers of the abſorbents for removing the blood already effuſed. In ſome ſuch caſes, where blood has remained long in contact with the extremities of the fractured bone, the power of forming callus appears to have been deſtroyed by it; the perioſteum ſeparates for a conſiderable ſpace from each end of the bone; and on laying the parts open, no union is found to have taken place; the ſpiculæ produced by the fracture remain equally ſharp as at firſt; and, for the moſt part, a thin fetid ſanies is diſcharged from the ſore.

In this ſituation, a cure will not be obtained till thoſe parts of the bone which have been denuded of the perioſteum have exfoliated. As exfoliation is in general a tedious proceſs, we would rather adviſe the removal of the denuded bone

by means of a ſaw. A more expeditious and more certain cure will thus be obtained.

Having premiſed theſe general obſervations, we proceed to the conſideration of fractures in particular parts.

SECTION II.

Of Fractures of the Noſe.

THE arch formed by the bones of the noſe prevents them from being ſo frequently fractured as they otherwiſe would be. They are neceſſarily, however, liable to every variety of fracture when expoſed to any great degree of violence.

Beſides the uſual ſymptoms of fractures, injuries of this kind in the bones of the noſe are apt to impede reſpiration; they affect

affect the ſpeech and the ſenſe of ſmelling; polypi and tedious ulcers ſometimes enſue from them; and they are rendered more particularly hazardous from their contiguity to the brain. Theſe fractures therefore require the moſt exact attention.

When we have aſcertained the nature and extent of the fracture, our next object is to replace the bones as nearly as poſſible in their natural ſituation. When any part of them have been elevated or raiſed above the level of the reſt, it muſt be preſſed into its ſituation with the fingers; while ſuch parts of them as may have been forced into either of the noſtrils muſt be elevated with the end of a narrow ſpatula, or any other inſtrument of a ſimilar form. Any portion of bone that is quite looſe, and nearly ſeparated from the reſt, ſhould be removed immediately, whether it be raiſed up or forced into the noſtril; but whatever adheres to the remaining portion of bone with much firmneſs, ſhould be replaced in the manner we have mentioned.

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If the bones be properly replaced, they will for the moſt part remain in their ſituation without any aſſiſtance. If there is a wound, it muſt be dreſſed in the uſual way; and whether the teguments be injured or not, we ſhould endeavour to prevent inflammation by the uſe of ſaturnine applications, and by local bloodletting when the violence of ſymptoms renders it neceſſary.

But when the parts that have been replaced do not remain firm in their ſituation, we are under the neceſſity of endeavouring to retain them. If they fall into the noſtrils, the beſt method of effecting this is to introduce ſuch tubes into them as are repreſented in Plate XLIII. fig. 2. If the tubes are covered with ſoft lint, ſpread with any emollient ointment, they may be kept in the noſtrils as long as may be neceſſary. While, on the contrary, if any part of the bone is raiſed above the reſt, it muſt be kept down by a proper application of a double-headed roller. If the teguments

ments are injured, the sore must be first dressed; care being taken in doing it to prevent deformity as much as possible: a compress of soft old linen must be next applied; and over the whole an equal pressure must be made by the bandage we have just mentioned.

In this manner a cure may be obtained of almost every injury of this kind, unless the bones have been so much shattered, that their reunion cannot be accomplished. In which event, all that art can do is to extract the detached pieces, and to co-operate as much as possible with nature in healing the remaining sore.

SECTION

SECTION III.

Of Fractures of the Bones of the Face.

WHEN treating of fractures of the ſkull, thoſe of the upper part of the face were conſidered. At preſent we have only a few obſervations to offer on fractures of the ſuperior maxillary and cheek-bones, being thoſe which form the moſt prominent parts of the ſides of the face.

The vicinity of thoſe bones to the eyes and to the noſe, and the ſituation of the antrum maxillare, make fractures of theſe important. When the fractures ſtretch toward the eyes, they are apt to induce much inflammation, which often proves dangerous; and when they penetrate the antrum, they not only prove extremely tedious, but very commonly occaſion a good deal of deformity: for

when the anterior part of that cavity is laid open, and any portion of the bone removed, the face becomes flat, and the teguments puckered, notwithſtanding all that can be done to prevent it.

In every injury therefore of this kind, we ought to be careful in replacing any portion of bone that may be fractured, ſo as to favour its reunion with the reſt; and any wound that accompanies the fracture ſhould be dreſſed with much attention, that deformity, as far as it is poſſible, may be prevented.

After the bones are replaced, which may be done either with the fingers where there is no wound, or with forceps or a narrow ſpatula when the parts are laid open, a piece of adheſive plaſter will anſwer better than any bandage for retaining the neceſſary dreſſings. Bloodletting and an antiphlogiſtic regimen muſt be adviſed to obviate inflammation of the eye or contiguous parts, which otherwiſe might enſue. The remaining part of the cure, namely, the reunion of the fractured

fractured parts of the bone, muſt be left entirely to nature.

When the fracture penetrates the antrum, the matter which collects in that cavity cannot be properly evacuated from any opening that may take place on the prominent part of the cheek. In conſequence of this, I have known ſinuous ulcers formed that have continued open for a great number of years. They can only be healed by giving a free vent to the matter, by an opening made in the moſt depending part of the cavity, in the manner we have adviſed in Chap. XXX. Section V.

SECTION IV.

Of Fractures of the inferior Maxillary Bones.

ALTHOUGH the bones of the under jaws are very ſtrong and compact, yet fractures of one, or even of both, are

not unfrequent. This ſeems to ariſe from blows or other injuries to which theſe bones are expoſed, being moſt apt to fall upon their anterior flat ſurfaces, where they are leſs capable of reſiſting violence than in any other part.

We judge of the exiſtence of a fracture in the jaw by the deformity which it occaſions; by the crackling of the bone when handled; by inability to move the jaw; by the violence of the injury, and the degree of pain with which it is accompanied.—When both jaws are broke, the injury becomes obvious; as in this caſe a conſiderable ſeparation takes place at the fractured part: but even where one bone only is fractured, it may be always diſcovered with a little attention.

The ſite of the fracture being exactly aſcertained, our next object is to replace the bones with as much care as poſſible: which is done by placing the patient in a proper light, having his head firmly ſecured, and the fingers of one hand preſſing

preſſing upon the inſide of the jaw, while the other hand is employed externally in guarding againſt any perceptible inequality of the bone. One of the teeth is commonly ſeated in the courſe of the fracture; and in this ſituation acting as an extraneous body, and thus tending to retard the cure, it ſhould be a general rule to extract it immediately: But when any of the teeth not ſeated in the courſe of the fracture, are forced out of their ſockets, it may be right almoſt in every inſtance to replace them, and to endeavour to fix them, by tying them to the contiguous firm teeth.

This being done, our next object is to retain the fractured bones in a proper ſituation till they are firmly reunited. For this purpoſe a variety of ſplints have been invented, both of paſte-board and other materials; but as a compreſs and bandage either of ſoft old linen or cotton anſwers the purpoſe with equal certainty, and as they fit with much more eaſe to the patient, they ſhould always be

be preferred. The parts being kept firm by an aſſiſtant, a thick compreſs ſhould be laid over the chin, and be made to extend from ear to ear along each jaw; and over the whole a four-headed roller ſhould be applied in the manner we ſhall mention when treating of bandages. In uſing this bandage, it ſhould not be made ſo tight as to give much uneaſineſs, or to endanger the circulation, at the ſame time that it ſhould be applied in ſuch a manner as to keep the fractured parts of the bone in cloſe contact.

During the cure the patient ſhould be kept perfectly quiet. He ſhould be fed entirely on ſpoon-meat. He ſhould be enjoined to avoid ſpeaking and laughter, or the uſe of his jaws in any manner of way. To prevent the diſplacement of the bones, which is apt to happen from frequent inſpection, the bandage ſhould be applied with ſuch attention, that there may be no occaſion to move it oftener than is altogether neceſſary. In compound fractures of this part, there is in-

deed a neceſſity for moving the bandage daily, as the ſore cannot otherwiſe be regularly dreſſed. It ought always to be done, however, with the utmoſt attention, an aſſiſtant taking care to ſupport the parts with his hands during the removal of the old, and the application of the new, dreſſings.

The management of a fracture of one or both jaw-bones is exactly ſimilar; only where both bones are broke, there is ſtill more attention required than when one only is fractured. In a fracture of one of the bones, the patient may be allowed to eat ſoft meats, and to ſpeak with freedom, in the ſpace of three weeks: But where both bones have ſuffered, this ſhould not be permitted till the concluſion of the fifth week.

SECTION

SECTION V.

Of Fractures of the Clavicles and Ribs.

THE clavicles and ribs are more liable to fractures than any other bones. This proceeds not only from the ſlender ſtructure of theſe bones, but from the tranſverſe poſition in which they are placed, with their flat-broad-ſides expoſed to every injury that may be applied to them.

A fracture of the clavicle is in general eaſily diſtinguiſhed. A grating noiſe is produced by the ends of the bone rubbing againſt each other on the arm of the ſame ſide being ſmartly moved. The ends of the fractured part readily yield to preſſure; and, for the moſt part, the end of the bone connected with the humerus is pulled to ſome diſtance from

the other by the weight of the arm. The motion of the humerus is impeded, and ſome degree of ſwelling, accompanied with more or leſs pain, takes place over the injured part.

In examining a fractured clavicle, we almoſt always find the end connected with the ſternum higher than the other, which has ſuggeſted an idea that has prevailed very univerſally in the method of cure. It is ſuppoſed that the height of this part of the bone proceeds from its having ſtarted or riſen out of its natural ſituation: In the reduction, therefore, of the fracture, a good deal of pains is commonly taken to preſs it down, and very tight bandages are employed to prevent it from riſing during the cure. I believe, however, it will be found, that this part of the bone riſes very little out of its natural ſituation, and that the appearance of its doing ſo proceeds almoſt entirely from the other end of the bone being dragged downwards by the cauſe we have mentioned, namely, by the weight of the arm. At any rate, no

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advantage is obtained from this practice: for a force that would be neceſſary for preſſing down the end of the bone cannot be applied without the effect of cutting the teguments, by preſſing them againſt that part of it which is ſuppoſed to be elevated; while our purpoſe is fully anſwered by raiſing the arm, and ſupporting it at a proper height. The depreſſed portion of the fractured clavicle is thus raiſed and brought into contact with the ſuperior part. In ſome caſes, indeed, of very oblique fractures, it may be impoſſible to bring the ends of the bone in every point exactly oppoſite to each other: but this may be always ſo far accompliſhed as to enable us to avoid deformity, and to render the bone ſufficiently ſtrong.

When the ends of the bone are brought into contact, our object is to retain them in this ſituation till they are united; and, as we have obſerved above, this can only be done by affording a proper ſupport to the arm.

The arm is uſually ſupported by a

ſling hung round the neck, adapted to the length of the arm, and every where equally applied to it. But the leather caſe repreſented in Plate LXXXI. fig. 1. anſwers this purpoſe with more eaſe and neatneſs. By means of it the fore-arm and elbow-joint are more equally and more effectually ſupported: and this laſt is a point of no ſmall importance; for if the elbow be allowed to drop, the humerus and ſcapula will both fall down, by which the ends of the fractured clavicle will again be ſeparated.

We are commonly directed in the treatment of fractures of this bone to have the ſhoulders drawn back and the head raiſed; and inſtruments are deſcribed for effecting theſe purpoſes. No general rule, however, of this kind can be laid down: for in ſome caſes we find that the fractured parts of the bone are kept moſt exactly together when the head is bent down upon the breaſt; while in others, it is better accompliſhed while the head and ſhoulders are raiſed.

In other points, fractures of the clavicle

vicle muſt be treated like ſimilar injuries in other parts of the body. When there is much pain and ſwelling, bleeding with leeches becomes proper; but in general, injuries of this kind are ſo ſlight, that the common ſaturnine applications prove ſufficient for removing any inflammation or ſwelling that occur. When the fracture is accompanied with a wound, any ſplinters of bone that may be diſcovered muſt be removed, and the wound itſelf dreſſed in the uſual way. It is proper, however, to remark, from the vicinity of the ſubclavian artery, that the removal of any portion of the clavicle muſt be attended with danger, and ought therefore to be managed with caution.

When the ends of the fractured part are ſupported with exactneſs, they will in general be firmly united in the ſpace of a fortnight; but the correſponding arm ſhould never be uſed with freedom till the end of the third or fourth week.

We diſcover fractures of the ribs by the ſeat of the pain, and by preſſure with

the fingers. For the moſt part, the ſymptoms which take place are moderate; the pain induced by the facture is inconſiderable, no fever occurs, and the patient ſoon gets well: But in ſome inſtances the pain is ſevere from the firſt; the breathing becomes difficult, attended with cough, and perhaps a ſpitting of blood; and the pulſe is quick, full, and ſometimes oppreſſed.

It will readily be underſtood, that a fractured rib cannot of itſelf induce any of theſe ſymptoms: But in ſome inſtances the ribs are not only fractured, but puſhed inwards upon the pleura and lungs; when, from the compreſſion and laceration of theſe parts, we may eaſily perceive how pain, oppreſſion in breathing, and fever, ſhould be induced; and at the ſame time be able to account for the emphyſematous ſwellings deſcribed in Chapter XXII. Section V.

In every caſe of fracture of the ribs, it is a ſafe and proper practice to diſcharge a quantity of blood proportioned

to

to the ſtrength of the patient. If any inequality is diſcovered, by one end of the rib having riſen above the other, we ought to endeavour by moderate equal preſſure to replace it; and to prevent it from riſing, a broad leather belt ſhould be applied, and drawn as tight as the patient can eaſily bear it. When a belt of this kind is properly lined, either with quilted cotton or flannel, it ſits with eaſe even when tolerably tight; and it ought to be continued for ſeveral weeks after the accident.

Even where the ſymptoms have at firſt been ſevere, they will commonly ſubſide upon the patient being freely blooded and kept quiet and on a low regimen: But where the oppreſſed breathing is kept up by air eſcaping from a puncture in the ſurface of the lungs, or by blood diſcharged from a ruptured intercoſtal artery into the cavity of the cheſt, or when the pain is prevented from ſubſiding by the fractured rib being forced in upon the pleura; it becomes neceſ-

ſary

ſary to make an opening with a ſcalpel. Where a portion of rib is merely forced inwards, this ſhould be done directly upon the injured part; and on the rib being laid bare, we ought to elevate that part of it that is depreſſed, either with the fingers, forceps, or a ſpatula. When the ſymptoms proceed from air or blood collected in the cavity of the cheſt, an opening ſhould be made to diſcharge them, in the manner pointed out in Chapter XXII. Sections III. and V.

Fractures of the ribs ſhould in every inſtance be treated with attention; but particularly where there is any tendency to phthiſis pulmonalis, when the irritation produced by a fractured rib is very apt to do miſchief.

SECTION

SECTION VI.

Of Fractures of the Sternum.

THE ſupport which the ſternum receives from the ribs, and the degree of elaſticity which it poſſeſſes, render it leſs liable than it otherwiſe would be to injury from external violence. It neceſſarily ſuffers, however, from the application of any great degree of force. In ſome caſes, it is fractured without being diſplaced: in others, it is not only broken, but at the ſame time beaten in upon the pleura.

A ſimple fracture of the ſternum is to be conſidered in the ſame light with ſimilar injuries done to the ribs, and ought to be treated in the ſame manner. But more danger is apt to enſue from any

portion of this bone being forced into the cheſt from the vicinity of the large blood-veſſels of the breaſt, while the ſymptoms with which it is accompanied are nearly the ſame; namely, pain in the injured part, cough, oppreſſed breathing, a quick and ſometimes an oppreſſed pulſe.

In ſlight affections of this kind, we are told, that the depreſſed portion of bone may be raiſed by deſiring the patient to make deep inſpirations; by placing a barrel or a drum under his back, and keeping him lying for ſome time in this poſture; and by the application of adheſive plaſter over the correſponding teguments; when, by elevating the ſoft parts, the bone beneath, it is ſaid, may frequently be raiſed along with them.

It is not to be ſuppoſed, however, that any advantage is to be derived from any of theſe methods; on the contrary, it is more likely that they may do harm: nor would they have been mentioned here, had it not been with a view to caution the younger part of the profeſſion, who,

who, finding theſe modes of practice recommended by all the older writers, might have been induced to adopt them without weighing their conſequences. As the ſkin is no where very intimately connected with the bone beneath, it is not probable that any portion of depreſſed bone will ever be raiſed by the external application of adheſive plaſters; and we may do harm by truſting to a mode of treatment that is to prove ineffectual. But the practice of adviſing deep inſpirations, and of laying the patient upon his back over a large barrel or any other convex body, muſt often do miſchief, by puſhing the lungs with more force againſt the depreſſed portion of bone than they otherwiſe would be.

When it therefore happens that the pain, cough, oppreſſed breathing, and other ſymptoms, do not yield to bloodletting and other parts of an antiphlogiſted courſe, ſome other method of cure ſhould be attempted. An inciſion ſhould be made upon the injured part

of

of a ſufficient length to admit of a free examination of the bone; when the depreſſed piece may be raiſed either with a common ſcalpel or a levator, if there be an opening that will admit an inſtrument; or when this is not practicable, an opening may be made for this purpoſe with the trepan, in the manner we have adviſed in ſimilar injuries done to the ſkull in Chapter XXVI.

I know that this will be conſidered by many as hazardous; but when a patient is in danger either from a portion of a depreſſed rib or of the ſternum, and which cannot otherwiſe be raiſed, I would never heſitate in adviſing it. If the operation be performed with caution, the bone may be raiſed with ſafety; and this being done, the ſore muſt be treated in the uſual way.

SECTION

SECTION VII.

Of Fractures of the Vertebræ, Os Sacrum, Coccyx, and Ossa Innominata.

FRACTURES of the vertebræ may be produced by falls and blows; but they are more frequently the conſequences of gun-ſhot wounds than of any other cauſe.

Injuries of this kind, for the moſt part, terminate fatally: for although many have ſurvived ſuch fractures for a conſiderable time, yet they generally linger and die of the conſequences. The ſpinous and oblique proceſſes of the vertebræ may indeed be broke without immediate danger; but very commonly the force which effects this gives ſuch a ſhock to the ſpinal marrow, as at laſt terminates

nates in the death of the patient: and a fracture extending through the body of a vertebra will probably, in every inſtance, prove fatal.

We judge that the vertebræ are fractured, by the feel, by the violence of the injury, and the ſeverity of the pain, and by the parts lying beneath the injured vertebra becoming paralytic when the ſpinal marrow is affected.

When any of the external parts of the vertebræ are looſe, we may in general replace them with our fingers; and confining the patient as much as poſſible to one poſture, we may, by means of the napkin and ſcapulary bandage, and proper compreſſes, retain them in their ſituation till they unite with the reſt of the bone.

Where this cannot be done, a patient is in general left to his fate, as it is not ſuppoſed that we can with propriety expoſe any of the vertebræ for the purpoſe of replacing ſuch parts of them as may be deranged: But wherever we find

find that the ſpinal marrow is compreſſed, as the immediate effect of an injury done to one or more of the vertebræ; and where there is reaſon to think that the compreſſion is produced by a fracture and depreſſion of a portion of bone, as we know from experience that every ſuch caſe will terminate fatally if the cauſe of compreſſion be not removed, it would ſurely be better to endeavour to raiſe it than to leave the patient under an abſolute certainty of ſuffering. By laying the injured parts freely open, we may be enabled to raiſe that portion of bone by which the compreſſion is produced; while it is not poſſible that the ſituation of the patient can be rendered more hazardous, even allowing the attempt to prove abortive.

In a caſe where ſymptoms of paralyſis were induced by a muſket-bullet lodged in the ſubſtance of one of the vertebræ, a complete recovery was obtained by extracting the bullet. A portion of depreſſed bone might in many inſtances be

removed with equal eaſe and ſafety; and we have reaſon to ſuppoſe that ſimilar effects would often reſult from it.

In fractures of the os ſacrum, the method of treatment muſt be nearly ſimilar to what we have juſt adviſed in fractures of the vertebræ; only, where the injury is ſeated near to the under part of the bone, as well as in fractures of the coccyx, when any part of it is preſſed inward, we may in ſome caſes be able to replace it, by puſhing it out with the finger of one hand introduced into the anus, while with the other we co-operate externally.

Where any of the oſſa innominata are broke, if the injury be deeply ſeated, the patient ought to be placed in that poſture in which he finds himſelf eaſieſt, and confined as much as poſſible to that ſituation till it is probable the bones may be united. Blood-letting, and an attentive regimen, ſuited to his ſtrength and the violence of the ſymptoms, may prevent

vent the inflammation which uſually ſupervenes from becoming conſiderable.

In more external fractures of theſe bones, we have it often in our power to replace ſuch parts of them as have been forced out of their natural ſituation; and by a proper application of bandages, we may alſo be able to retain them till a cure is completed. I have had different inſtances of a conſiderable portion of the ileum being fractured and ſeparated from the reſt, and of a cure being eaſily accompliſhed, by replacing the parts that were ſeparated, and retaining them with a broad roller paſſed ſeveral times round the pelvis and upper part of the thigh.

With reſpect to the application of ſuch a bandage, no general directions can be given: It muſt depend entirely on the judgment of the practitioner; who will apply it in the way which he thinks will make it anſwer the purpoſe of fixing the bones in the moſt effectual manner.

SECTION VIII.

Of Fractures of the Scapula.

THE ſcapula, from its ſituation, is not ſo liable to be fractured as other bones; but every practitioner muſt have met with inſtances of this accident. It may be fractured either in the thin plate, of which it is moſtly formed; or in one or other of its proceſſes.

As the motion of the arm depends much on a ſound and entire ſtate of this bone, and as fractures of any part of it are difficult to cure, they very commonly produce a ſtiff unwieldy ſtate of the corresponding arm, which uſually continues during the life of the patient.

We diſcover that the ſcapula is fractured, by the ſeat of the pain; by the violence

violence of the injury; by the feeling on preſſing the injured parts; and by ſtiffneſs and immobility in the correſponding arm. We are told, that fractures of the ſcapula are apt to be accompanied with emphyſematous ſwellings. Theſe can only appear when the lungs are wounded by a ſplinter of the ſcapula, or of a fractured rib being forced into their ſubſtance. When this takes place, air will no doubt eſcape; and if it paſſes into the cellular ſubſtance, emphyſematous ſwellings will neceſſarily occur.

In the treatment of fractures of the ſcapula, our firſt object is to replace the bones with as much exactneſs as poſſible; and in doing ſo, we will be much aſſiſted by relaxing all the muſcles connected with the injured part. By raiſing the head and ſhoulders we relax the muſcles of the back; and if, at the ſame time, the humerus be ſupported, the deltoid muſcle will be ſo much relaxed, that any fractured portion of the ſcapula may be eaſily replaced. There is more difficul-

ty, however, in retaining the bones during the cure, than in replacing them: for the detached portion being in general ſmall, it is often impoſſible to retain it with a bandage. A proper application of a long roller is perhaps the only method by which it can be done; and in uſing this bandage, we ſhould ſtill take care to have the head and ſhoulders ſupported, and the arm ſuſpended, ſo as to keep all the muſcles of the injured part as much relaxed as poſſible.

As fractures in every part are apt to excite inflammation, we have elſewhere obſerved, that this ſymptom ſhould at all times be guarded againſt. It is no where, however, more neceſſary to be attentive to this than in fractures of the ſcapula, where inflammation is more apt to proceed to an alarming height than in any other part. Blood-letting ſhould therefore be freely practiſed; particularly local blood-letting with leeches, or cupping and ſcarifying; which we have often had occaſion to recommend as per-

haps

haps the moſt effectual means of removing inflammation wherever it may be ſeated.

SECTION IX.

Of Fractures of the Humerus.

AS the humerus is not thickly covered with ſoft parts, any fractures to which it is liable are, in general, eaſily diſcovered. When they run obliquely, they become often evident to the ſight; as in that caſe the bones are apt to overlay one another: but we have ſeldom any difficulty in diſcovering even tranſverſe fractures; which we do by the ſeat of the pain, the violence of the injury, inability to move the injured arm, and a grating noiſe being heard on handling the parts affected.

In reducing fractures of this bone, we do not find that much extenſion is neceſſary; but in order to accompliſh it with eaſe, the muſcles of the arm ſhould be put as much as poſſible into a ſtate of relaxation; which is done by bending the elbow moderately, at the ſame time that the limb is raiſed nearly to a horizontal direction, and not carried ſo far forward as to put the latiſſimus dorſi, inſerted into the back part of it, on the ſtretch, or too far back to ſtretch the pectoral muſcle.

The patient being properly placed, and the arm put into this ſituation, the ſurgeon will in general be able to replace the bones without any aſſiſtance: But when extenſion is neceſſary, it may be applied by one aſſiſtant graſping the arm between the fracture and the joint of the ſhoulder, and another above the joint of the elbow.

In this manner the fractured bones are to be exactly replaced; and with a view to ſecure them in this ſituation, one ſplint

of

of a proper degree of firmneſs, ſuch as are repreſented in plate LXXI. figures 5. and 6. ſhould be laid along the whole outſide of the arm, and another along the inſide of it, each of them covered with ſoft thin flannel, to prevent them from galling the arm; and while theſe are ſecured by one aſſiſtant, and the fore-arm ſupported by another, a flannel roller ſhould be applied over the whole, of ſuch tightneſs as to ſupport the ends of the fractured bone without interrupting the circulation of the limb.

The fore-arm ſhould be ſupported in a ſling, ſuch as is repreſented in Plate LXXXI. fig. 1. and the patient may be either put to bed or allowed to ſit, as is moſt agreeable to himſelf. It may not, however, be improper to remark, that it anſwers better to have the arm in a hanging poſition than laid horizontally upon a pillow; particularly in oblique fractures of this bone, where the weight of the limb has a conſiderable effect in preventing the ends of the bone from over-

lapping each other. Even in bed, therefore, where there is any danger of this taking place, the patient ſhould be placed in ſuch a manner, that his arm may hang inſtead of being laid in the uſual poſture. In tranſverſe fractures, this precaution is not altogether ſo neceſſary, as the ends of the bone, if they be once properly replaced, ſerve effectually to ſupport each other. But even in theſe, it is the beſt practice to ſupport the forearm in ſuch a manner that it may have ſome effect in pulling the under part of the humerus gently downwards.

If no urgent ſymptom occurs, ſuch as much pain and ſwelling of the arm, the bandage ſhould not be moved for ſeveral days: But about the ſeventh or eighth day, it is proper, in every fracture, to remove all the coverings, in order to ſee whether the bone be perfectly in its place or not: for at this period any accidental diſplacement may be eaſily put right, and a cautious inſpection may be made with the utmoſt ſafety.

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We have adviſed a roller to be employed for fractures of this bone; and perhaps it is the only inſtance in fractures of the large bones of the extremities in which it ſhould be preferred to the many-tailed bandage. But whoever has uſed them both will find, that in ſimple fractures of the humerus, the roller is not only more eaſily applied than the other, but that it anſwers the purpoſe better.

Fractures of the humerus commonly heal more kindly than ſimilar injuries of any other part; and when properly managed, they ſeldom leave either lameneſs or diſtortion of the arm. When no interruption occurs to the cure, either from ſevere pain, ſwelling, or inflammation, or from accident or miſmanagement, the bone will in general be firmly united in leſs than a month; but the limb ſhould not be uſed with much freedom till the ſixth or ſeventh week.

SECTION

SECTION X.

Of Fractures of the Bones of the Fore-Arm.

THE bones compoſing the fore-arm are two in number, the radius and ulna. From their being much expoſed to accidents, they are very liable to fractures. When both bones are broken, the nature and ſeat of the injury are for the moſt part eaſily diſcovered; but when one bone only is fractured, eſpecially if it be the radius or ſmaller bone, as the firmneſs of the other prevents it from being diſplaced, it requires ſome attention to diſcover it. The ſeat of the pain points out the injured part; and when either of the bones is fractured, a grating noiſe will be heard if the ſurgeon graſps the limb firmly above and below this

this part, and endeavours to move it in different directions.

In this examination, it is of much importance to diſtinguiſh the direction of the fracture with as much exactneſs as poſſible, particularly if it be near to the wriſt; for upon this the chance of our making a proper cure in a great meaſure depends: and in this ſituation, whether both bones or only one of them be broke, the utmoſt nicety is required to prevent a ſtiff uneaſy ſtate of the arm from continuing long after the fracture is healed. It is not unfrequent, indeed, to hear patients complain of this inconvenience after theſe fractures during the remainder of their lives; and I think it is more apt to happen when the radius is broke by itſelf than when the ulna only is fractured, owing to this bone having a rotatory motion independent of the other, by which it is with more difficulty kept in its ſituation. And as there is nothing for which practitioners are more apt to be blamed than for thoſe inconveniences

conveniences which patients ſuffer after the cure of fractures, we ought, in every caſe of this kind, to treat it with the utmoſt attention.

After diſcovering the ſeat of the injury, if any part of either of the bones be diſplaced, we ought, as ſoon as it can be done with propriety, to put it right. The patient being properly ſeated, and the muſcles of the arm relaxed by bending the joints of the wriſt and elbow, the limb ſhould be extended to ſuch a degree, by one aſſiſtant graſping it above the fracture and another beneath it, as is juſt ſufficient to allow the ſurgeon to replace the bones with exactneſs. This being done, one of the ſplints repreſented in Plate LXXI. fig. 3. 4. or 5. covered with ſoft flannel, and of a length to reach from the elbow to the tops of the fingers, and of ſuch a breadth as to incaſe rather more than one half of the arm and hand, ſhould be placed along the ulna. Another ſplint not quite ſo broad muſt be placed along the courſe

of

Plate. lxx.

Fig. 1.

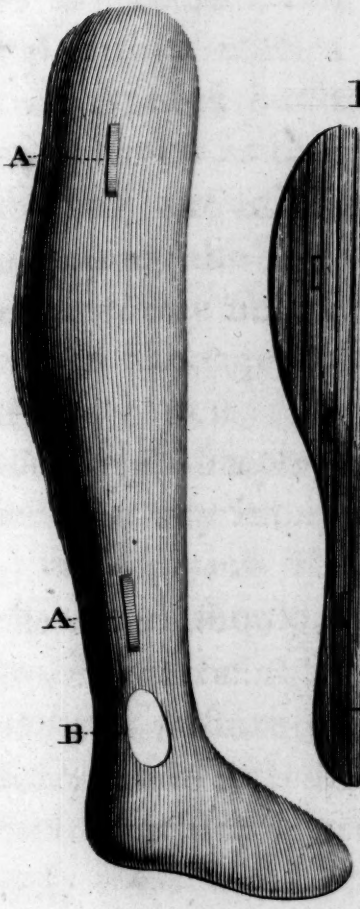


Fig. 3.

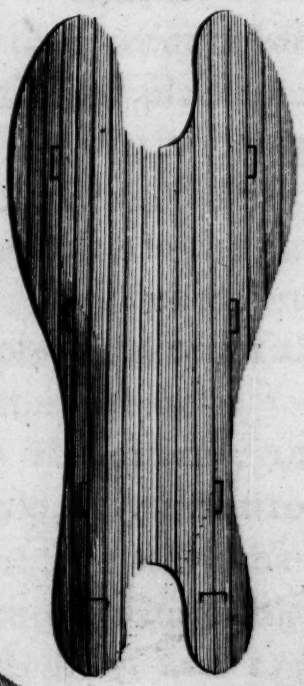


Fig. 2.

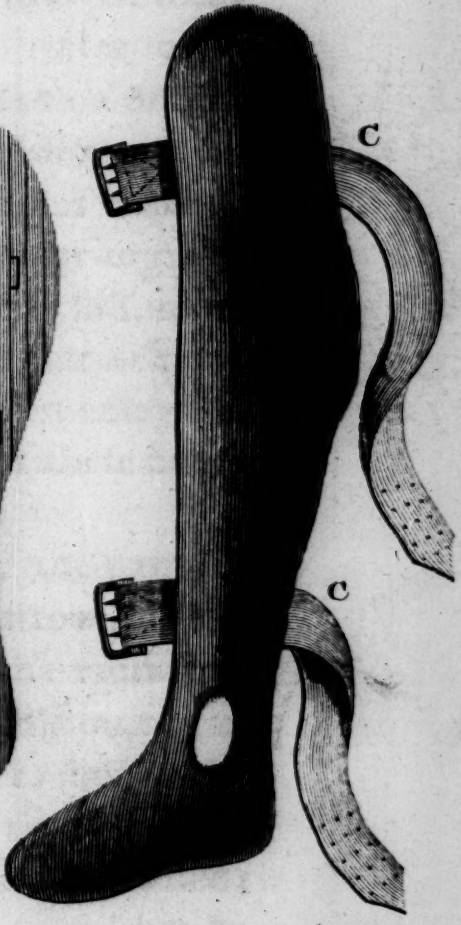


Fig. 4.

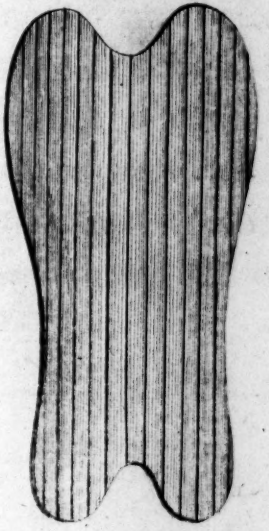


Fig. 5.

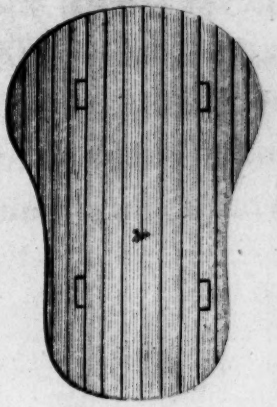
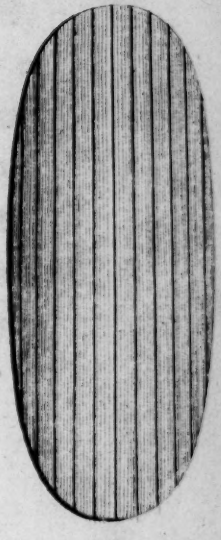


Fig. 6.



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of the radius; when both may be ſecured either with a flannel roller or a twelve-tailed bandage, of ſuch a degree of tightneſs as to prevent the bones from ſlipping out of their place, but without impeding the circulation or giving the patient any uneaſineſs. The laſt mentioned bandage anſwers the purpoſe extremely well; but the roller may be uſed in all ſimple fractures of theſe bones without any impropriety.

In applying the ſplints, the palm of the hand ſhould be turned towards the breaſt, as being not only the moſt convenient poſture in which the arm can hang while in a ſling, but as being the beſt in which it can at all times be placed, even when the patient is in bed: for the palm of the hand can neither be turned upwards nor downwards; that is, it can neither be put into a prone nor a ſupine poſture, without giving that rotatory motion to the radius which we have mentioned, and which tends more than any other to diſplace any part of this bone

bone that is fractured. It ought, therefore, to be carefully guarded againſt; and I know of no method by which it can be done with ſuch certainty as ſecuring the arm with ſplints in the way we have pointed out. It muſt now be hung in the ſling, repreſented in Plate LXXXI. fig. 1. and allowed to remain in the leather caſe during the night, or in any ſmall box of a ſimilar conſtruction, and of a ſize juſt ſufficient to receive the arm when placed upon its ſide, but without admitting of its turning either one way or another.

In ſpeaking of the ſplints, I have adviſed them to be of a ſufficient length for ſtretching along the whole courſe of the arm from the elbow to the top of the fingers. The under one ought more eſpecially to be of this length: for the arm not only reſts with more eaſe and equality upon a long ſplint, but it ſerves to cover the fingers, by which they are prevented more effectually than in any other manner from moving; a cir-

circumſtance of much importance in all fractures of the fore-arm: for when a free motion of the fingers is permitted, it not only tends to keep up inflammation and pain, but is often the cauſe of the bones being again diſplaced, when otherwiſe they might have been kept in contact.

A partial diſlocation of the bones forming the joint of the wriſt, is not an unfrequent concomitant of a fracture of the radius; by which the riſk of a ſtiff joint, or of a painful permanent ſwelling of the arm, becomes conſiderable. In ſuch circumſtances, it is therefore always proper to inform the patient of his danger: for even under the beſt management, a diſlocation of the wriſt, and a fracture of the contiguous bone, are apt to be productive of this effect. For the method of reducing the diſlocation we muſt refer to the enſuing chapter; and we have already pointed out, in the firſt ſection of this chapter, the moſt effectual method with which we are acquainted,

of preventing and removing inflammation; which we have there ſhown to be the moſt frequent cauſe of that ſtiff immoveable ſtate in which fractured limbs are often left.

The olecranon, or upper end of the ulna, is ſometimes fractured without any injury being done to the reſt of the bone; this part of the bone being particularly apt to ſuffer from falls and bruiſes upon the elbow.

In this caſe, in order to keep the fractured parts in contact, the fore-arm muſt be extended: And with a view to preſerve the arm ſteadily in this ſituation, a long ſplint ſhould be laid along the fore-part of it, from the middle of the humerus to the tops of the fingers; and this being properly ſecured with a roller, the arm ſhould be allowed to hang by the patient's ſide, to which it ſhould be fixed by one or two ſtraps.

It is proper, however, to remark, that the arm ſhould not be kept long in this ſituation, otherwiſe a ſtiffneſs of the elbow

elbow-joint will very probably happen. With a view to prevent this, the bandage and ſplint ſhould be removed about the eighth or tenth day; when the fore-arm being for ſome time moved ſlowly backward and foreward, and the joint rubbed with any emollient oil, the arm may be again ſecured as before. A cautious and daily repetition of this practice, while it prevents the occurrence of a ſtiff joint, does not retard the cure.

SECTION X.

Of Fractures of the Bones of the Wriſt, Hands, and Fingers.

THE bones of the wriſt being ſmall, round, and ſomewhat moveable, readily yield to any ordinary force that may be applied to them. On this account, they

are ſeldom fractured except by ſhot from fire-arms, or a heavy weight paſſing over them.

The bones here are ſo ſmall that they do not readily reunite. For this reaſon, as well as from the contiguity of tendons and ligaments, which gives riſe to high degrees of inflammation, a complete anchyloſis, or great ſtiffneſs of the joint, are common conſequences of fracture of the bones of the wriſt. After replacing the bones, nothing proves ſuch an effectual preventative of theſe effects as copious blood-letting from the injured parts by means of leeches, in proportion to the violence of the ſymptoms and the ſtrength of the patient: and this being done, the arm and hand ſhould be ſupported by a ſplint put beneath them, with another above, in the manner we adviſed in the laſt ſection; and both ſhould be ſecured by a ſimilar bandage and ſling.

In fractures of the metacarpal bones, after replacing them with as much exactneſs as poſſible, a firm ſplint, either of timber

timber or ſtrong paſteboard, ſhould be applied over the whole palms of the hand and inſide of the arm, from the ends of the fingers to the joint of the elbow, in order to keep the hand as much extended as poſſible, as the flexor muſcles of the fingers cannot be bent in any degree without altering the poſition of theſe bones; and in order to guard againſt this with as much certainty as poſſible, the long ſplints mentioned above, with a ſimilar bandage, may be applied over the whole.

Fractures of the fingers are frequent; but when properly treated the bones readily unite, and the fingers become equally uſeful as before.

The beſt ſplint for a fractured finger is a piece of firm paſteboard exactly fitted to it, and ſoftened in water till it is eaſily moulded into the form of the part. The finger being ſtretched out and the bone replaced, this ſplint ſhould be applied along the whole length of it, and ſecured with a narrow roller: And in or-

der to prevent the injured parts from being diſturbed, a large ſplint, either of the ſame kind of paſte-board, or of a thin piece of wood glued upon leather, as is repreſented in Plate LXXI. fig. 3, 4, 5, or 6. ſhould be applied over the inſide of the hand; and the fingers being ſtretched upon it, another roller ſhould be put over the whole, to ſecure the fingers and hand, ſo as to prevent them from having any kind of motion.

With a view to preſerve the motion of the joints of the fingers, the bandage and ſplints ſhould be removed about the tenth or twelfth day; when the ſeveral joints of the finger being cautiouſly bended and extended different times, the whole ſhould be tied up as before: And this being repeated daily, the ſplints may with ſafety be removed at the end of the third week; when, by this piece of attention, the motion of the finger will be found complete, unleſs more than one bone has been broke, and at the ſame time

time ſo much ſplintered as to render this precaution impracticable.

SECTION XI.

Of Fractures of the Femur or Thigh-Bone.

EVERY part of the femur is expoſed to fractures: but it is more frequently broke near to the middle than in any other part of it; and next to this, that part of it termed the Neck of the Femur is moſt apt to ſuffer.

Fractures of all the under part of the femur are for the moſt part eaſily diſtinguiſhed, by the uſual grating noiſe of the ends of the bone on their being forcibly rubbed together; by the limb being much ſhortened if the fracture be oblique, or if the ends of the bone have been diſplaced in caſes of tranſverſe frac-

tures; by much pain and tenſion over the injured part; and by the limb being rendered unable to ſuſtain the body.

It is often difficult, however, to diſtinguiſh fractures of the neck of the femur from diſlocations of this bone. A due attention to the following circumſtances will enable us in moſt inſtances to avoid miſtakes of this kind, which are always attended with ſerious conſequences.

In a great proportion of caſes, perhaps in nineteen of twenty, the head of the femur when diſlocated is puſhed inwards and downwards, owing to the brim of the acetabulum being not ſo deep in this part as in others, as well as to the muſcles at this particular part being not ſo ſtrong; while perhaps in an equal number of fractures in the neck of the femur, the bone is puſhed upwards, owing to accidents of this kind happening moſt frequently from falls upon the knees, or perhaps upon the feet when the legs are ſtretched out, by which a very conſiderable force is neceſſarily brought to act againſt the

PLATE. LXXI.

FIG. 1.

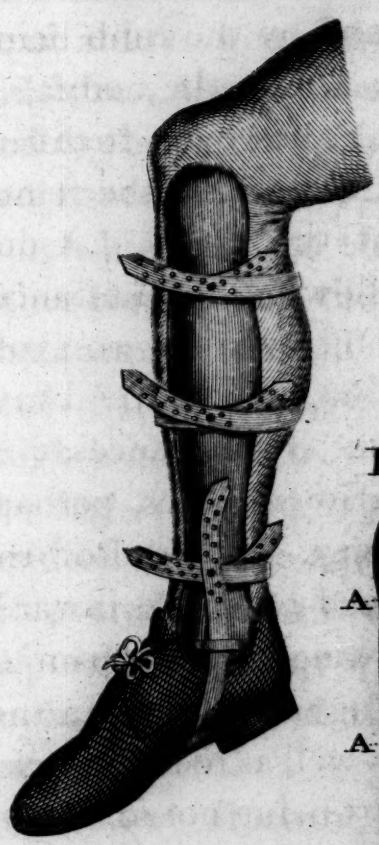


FIG. 2.

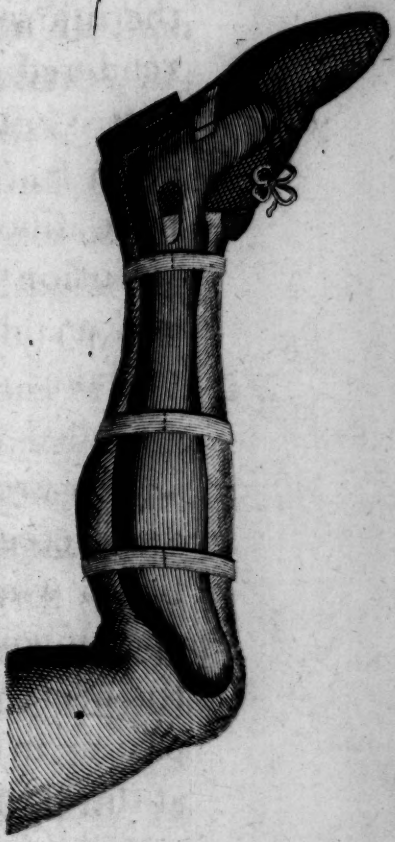
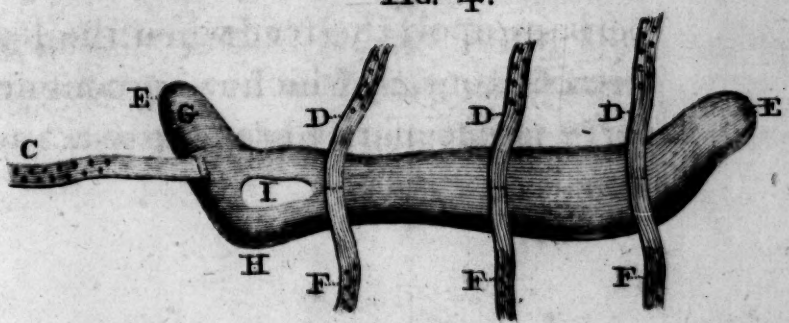


FIG. 3.



FIG. 4.



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the neck of the thigh-bone, where it is leaſt able to give reſiſtance. In all ſuch fractures, the leg is much ſhortened, often to the extent of ſeveral inches. The trochanter is accordingly found to be much higher than the trochanter of the other thigh; and the knee and points of the toes are turned inwards. On the other hand, in thoſe diſlocations of the thigh-joint which we have mentioned, the leg is conſiderably lengthened, the head of the bone and the trochanter are diſcovered near to the groin, with a correſponding vacancy where the trochanter ought to be, and the toes are turned out.

In every fracture, a grating noiſe is diſcovered on the ends of the bone being rubbed againſt each other; and in all fractures of the neck of the femur, it is obſerved that the leg and thigh may be turned with much more eaſe from one ſide to another, that is, the knee and foot may be moved with more eaſe outwards or inwards, than when the head of the

the bone is diſlocated. We may likewiſe remark, that in diſlocations the tumor formed by the head of the bone and trochanter together, muſt be always greater than in fractures, where the tumor is formed by the trochanter alone.

In no part of ſurgery are we more apt to be diſappointed than in the treatment of fractures of the thigh, particularly where the neck of the bone is broke. This proceeds from various cauſes; all of which ſhould be kept in view in forming a prognoſis of the probable event of ſuch caſes.

1. The thigh-bone is ſo thickly covered with muſcles and other ſoft parts, that it is often with difficulty we can diſcover the direction in which a fracture runs.

2. We muſt often, therefore, be uncertain whether the bones be rightly replaced or not; for where the courſe of a fracture cannot be aſcertained with exactneſs, we can never be ſure of this being preciſely effected.

3. But

3. But even where we are able to accompliſh the reduction of the fracture with the utmoſt nicety, we know from daily experience that it is extremely difficult to retain the bones in their ſituation with ſuch exactneſs as to prevent deformity. For when a fracture is either ſeated in the neck of the bone, or runs obliquely in any other part of it, it is ſo difficult to prevent the bones from being diſplaced merely by the ordinary action of the muſcles, that the limb is for the moſt part rendered conſiderably ſhorter than the other; for in all ſuch caſes, if the different parts of the bone cannot be ſo placed and retained as to ſupport each other, the under part of it will very certainly be drawn upwards.

In fractures of the thigh too, other cauſes concur to render it difficult to retain the bones in their ſituation. They are more affected than fractures of other bones by every unuſual exertion of the body; particularly by ſneezing, coughing, and laughing; nor can the poſture of the body

dy be in any way altered without affecting the thigh.

In the reduction of a fracture of this bone, much difficulty was formerly experienced from the poſition in which the limb was put during the operation. The body being placed either upon the floor, on a table, or in a bed, the limb was then extended, by which all the muſcles connected with it were put upon the ſtretch; and as the extenſion was continued till the bones were replaced, when this was accompliſhed with difficulty, the muſcles were often either violently tore aſunder, or ſo much weakened as not to be afterwards fit for uſe; for ſome of the muſcles of the thigh being among the ſtrongeſt in the body, a very conſiderable force was required to overcome the reſiſtance they afforded. But if the muſcles of the limb are relaxed, by making the thigh form an obtuſe angle with the body, while the joint of the knee is moderately bent, it is ſurpriſing with what eaſe we may, in moſt caſes, place the bones

in

PLATE. LXXII.

FIG. 3.

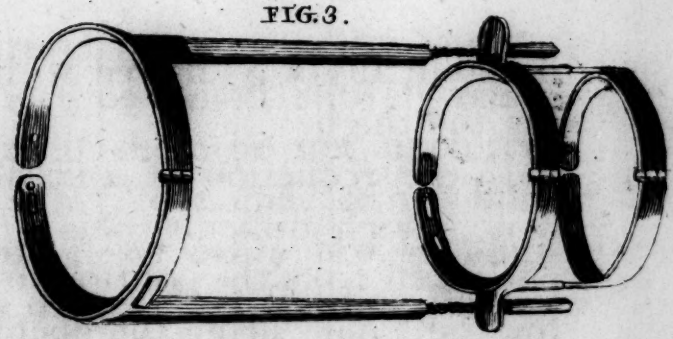


FIG. 4

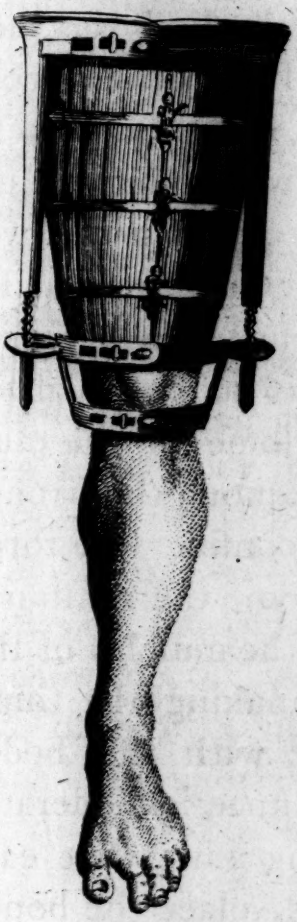


FIG. 1.

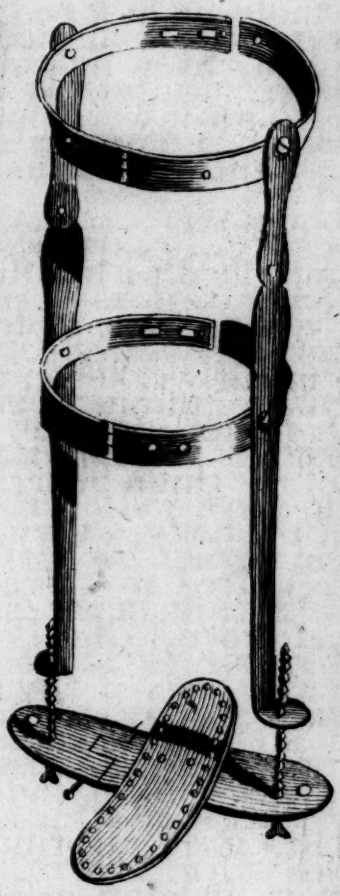


FIG. 2.

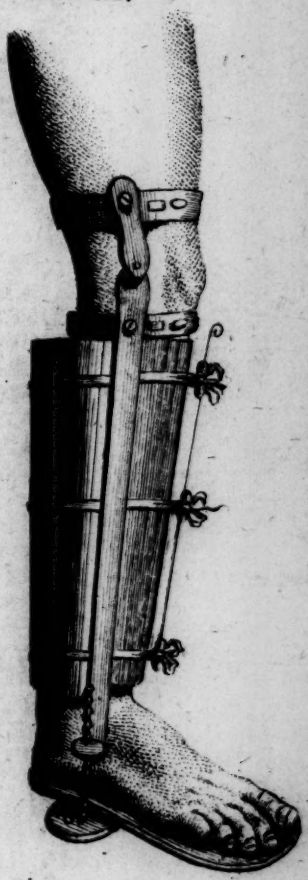
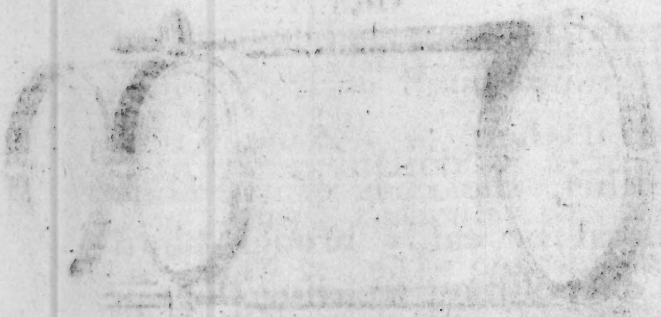


FIG. 5.





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in their natural ſituation. The cauſe of reſiſtance is thus almoſt entirely removed; ſo that if there be not much tenſion or ſwelling, the ends of the bone may in general be eaſily brought into contact, by one aſſiſtant ſecuring the upper end of it, while the lower part of it is ſupported and gently drawn down by another, the ſurgeon in the mean time being employed in putting the fractured parts together with as much exactneſs as poſſible.

There is moſt difficulty in reducing fractures of the neck of the bone; for the muſcles, in that ſituation, being exceedingly ſtrong, and running in various directions, they cannot be relaxed ſo completely as thoſe of other parts of the limb. But even here we may, for the moſt part, ſucceed in the manner we have mentioned, the body being ſecured by one aſſiſtant, while moderate extenſion is made by another at the lower part of the thigh. It is proper, however, that practitioners be provided with inſtruments

ments for more powerful extenſion when the method now recommended fails. Different inſtruments are delineated for this purpoſe in Plates LXXVI. LXXVII. and LXXVIII.; but theſe ſhould never be employed till every attempt in the uſual manner proves abortive.

It is not, however, in replacing the bones, but in retaining them when replaced, that we encounter the greateſt difficulty. In tranſverſe fractures of this bone the practice is very eaſy. After the fractured ends of it are brought into contact, they would for the moſt part ſupport each other with ſufficient firmneſs even without any bandage, if the patient could be confined to a proper poſture: But to prevent any riſk from ſudden exertions, the limb ſhould be as firmly ſecured with ſplints and a proper bandage, as is conſiſtent with a free circulation through the injured parts.

For this purpoſe two ſplints are repreſented in Plate LXX. fig. 4. and 6. One to reach from the top of the hip-joint

to a little below the knee, of a breadth ſufficient to cover at leaſt one half of the thigh; the other to reach from the groin to a little below the knee, and in breadth covering about a third part of the thigh. Of theſe, covered with ſoft flannel, the longeſt laid upon a twelve-tailed flannel bandage, is to be placed upon a thin pillow nearly as long as the thigh. The patient being placed in a bed made as tight as poſſible with a firm hair mattraſs, ſo that it may not ſink or yield, his knee being moderately bent, and the bones accurately ſet, the ſurgeon muſt order the pillow, with the bandage and ſplint above it, to be placed ſo as the ſplint may reach from the hip-joint along the outſide of the thigh to the knee. That this poſture of the leg and thigh may be eaſily preſerved, the patient ſhould not be laid directly upon his back, but turned ſomewhat towards the affected ſide; and the knee and leg ſhould be raiſed rather higher than the body.

The

The limb being thus placed in the poſture in which it is to be kept, the ſhort ſplint mentioned above muſt be laid along the inſide of the thigh from the groin to the knee, when the bandage previouſly placed beneath the other ſplint muſt be applied, of ſuch a tightneſs as to make an equal moderate preſſure over the whole thigh.

As the cure would be much interrupted, and might at laſt be very incomplete, were any part of the dreſſings to give way, it is a proper precaution perhaps in every caſe, to inſert a long ſplint of firm timber beneath the middle of the pillow, and to ſecure it in its ſituation by two broad ſtraps firmly buckled on the upper part of the limb.

To obviate the motion of the limb, in conſequence of involuntary ſtartings, the pillow ſhould be fixed to the bed by ſtraps; and to prevent injury or uneaſineſs from the weight of the bed-cloaths, two or three hoops fixed in a proper frame ſhould be placed over the thigh.

When no untoward ſymptom occurs, the limb might be left in this ſituation till the cure was completed; but leaſt the bones ſhould by accident be diſplaced, and eſpecially if the limb ſhould ſwell and become painful, the bandage ſhould be undone, and the upper ſplint removed, in order to admit of the parts being examined with accuracy. The twelve or eighteen tailed bandage admits of this being done without the limb being diſturbed. In the event of pain, ſwelling, or inflammation, it may be proper, before renewing the dreſſings, to apply leeches and other remedies to the parts affected; but when none of theſe take place, and when the bones are found in their ſituation, the ſplint ſhould be immediately replaced and ſecured with the bandage as before.

In healthy adults, when the cure proceeds without interruption, it will in general be completed in the courſe of ſix weeks; but violent exertion of every

kind ſhould be avoided till the eighth or tenth week has paſſed over.

We have adviſed the limb to be placed in ſuch a poſture as tends moſt effectually to relax all the muſcles connected with it. But although this may be highly proper at firſt; yet there is no neceſſity for perſevering in it during the whole courſe of the cure. On the contrary, it proves often very prejudicial, as the limb, if it be kept unvariably in one poſture for ſix or eight weeks, as is too frequently practiſed, is very apt to become ſtiff and unwieldy, ſo as to be afterwards productive of much uneaſineſs and diſtreſs. At the end of a fortnight, or even in leſs time than this, the patient may be allowed to turn more towards his back, and the joint of the knee may be ſomewhat ſtretched out. If this be done with caution, it may be repeated daily; that is, the leg may be alternately ſtretched out and bent; by which the motion of the whole limb will be much more free and

entire

entire at the end of the cure than we uſually find it to be.

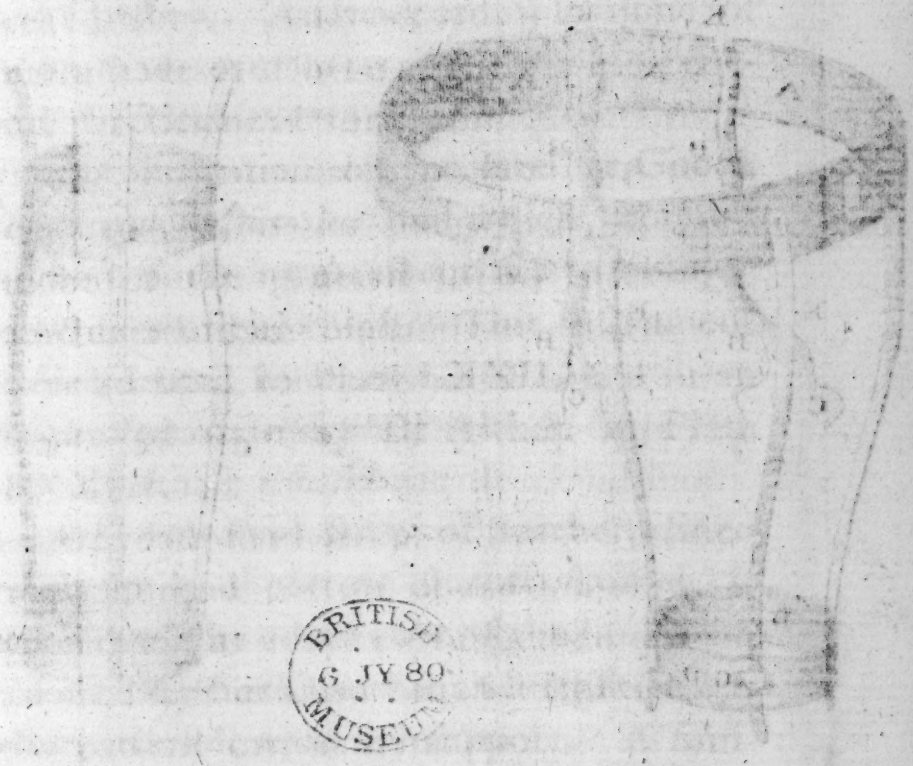
In a great proportion of caſes where cures are practicable, the mode of treatment we have here pointed out will prove ſucceſsful. It will never fail in tranſverſe fractures, if all the parts of it meet with proper attention: but altho' it will often ſucceed where the bone is broke very obliquely; yet it muſt be confeſſed, that caſes of this kind ſometimes occur in which it fails entirely, the ends of the bone ſlipping paſt each other, and the limb becoming much ſhorter than it ought to be, notwithſtanding all our efforts to prevent it.

Indeed, an effectual method of ſecuring very oblique fractures in any of the bones of the extremities, and eſpecially of the thigh-bone, is perhaps one of the greateſt deſiderata in modern ſurgery. In all ages, the difficulty attending this has confeſſedly been very great; and frequent lameneſs from ſhortened limbs proceeding from this cauſe, evi-

dently ſhows that we are ſtill deficient in this branch of practice.

The treatment of fractures being one of the moſt important branches of ſurgery, and to prevent lameneſs one of our firſt objects, much ingenuity has been ſhown in the invention of ſome method by which this purpoſe might be anſwered. It has been propoſed, and by ſeveral practitioners has been attempted, in fractures of the thigh, to ſecure the patient's body, as one fixed point, by means of different bandages, to the upper part of the bed, and by an axis in peritrochio at the foot of the bed, to make ſuch a degree of extenſion as might be fully equal to the purpoſe of retaining the fractured bones. But all who are acquainted with the fretful irritable ſtate in which patients with fractures commonly are, and with the pain which tight bandages always excite, will know, that although propoſals of this kind may appear to advantage in theoretical diſquiſitions, they will never probably be of

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PLATE. LXXIII.

FIG. 1.

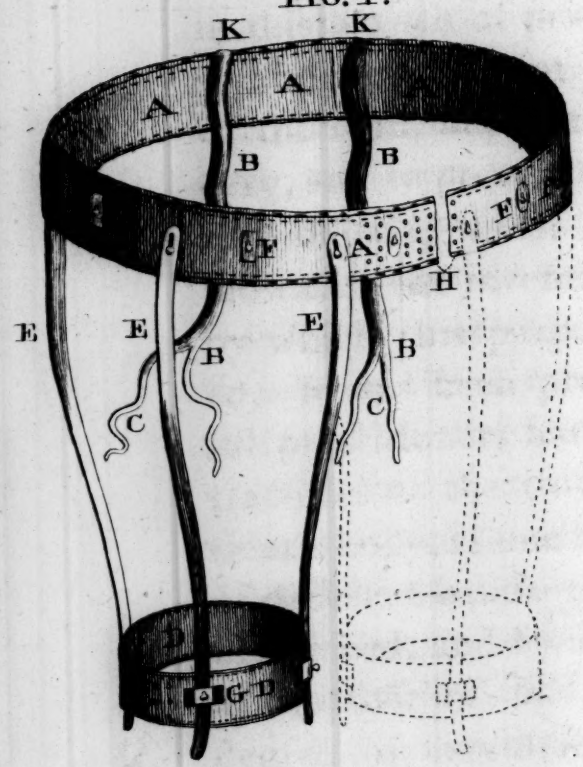
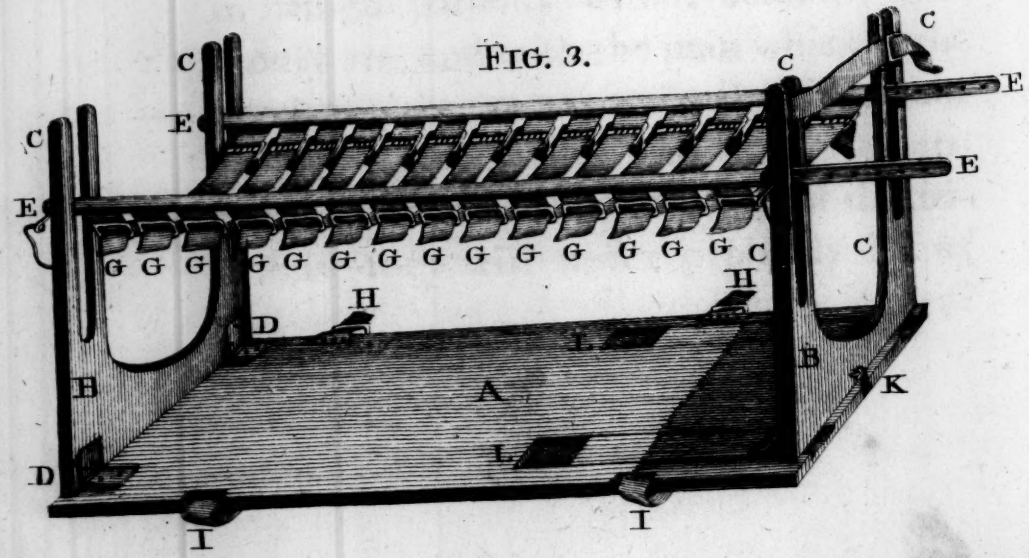


FIG. 2.



FIG. 3.



real utility. And accordingly none of them have ever been admitted into general practice.

The invention of the late Mr Gooch of Norwich, is the one which promiſes to be of the greateſt utility in oblique fractures of the thigh. This inſtrument is delineated in Plate LXXII. and in an improved ſtate by Dr Aitken in Plate LXXIII.

A broad firm ſtrap of leather, lined with quilted cotton or ſoft flannel, is placed on the upper part of the limb, and ſecured by buckles of ſuch a tightneſs as the patient can eaſily ſupport. A ſimilar ſtrap is put round the under part of the thigh, and made to reſt chiefly on the condyles of the femur. Two or three ſteel ſplints, connected with the ſtraps, paſs from one to the other in ſuch a manner, that by means of them the ſtraps can be forced aſunder, and retained with the greateſt certainty at any diſtance during the cure.

For a more particular account of this

apparatus, the explanation of the plates may be conſulted.

In ſome caſes, however, the pain, ſwelling, and inflammation, are ſo conſiderable, as to preclude the application of the moſt ſimple bandage. After endeavouring to relieve the ſymptoms by local blood-letting and other remedies, Mr Gooche's method, or Dr Aitken's, may be adopted, if practicable; if not, the cure muſt be conducted in the uſual way, with the hazard of the ends of the bone paſſing one another, and of the limb being ſhortened. But in this event, under the circumſtances we have juſt mentioned, although the patient may regret his misfortune, he cannot with propriety or juſtice blame the ſurgeon.

SECTION

SECTION XII.

Of Fractures of the Patella.

THE patella or knee-pan is liable to fractures from falls and bruiſes upon the knee. Tranſverſe fractures are moſt frequent; but we meet with inſtances of longitudinal fractures in this bone, and in ſome caſes it is broke into three or four different pieces.

In fractures of the patella, we are in general deſired to make a very guarded prognoſis; as by moſt writers upon this ſubject, it is ſaid that they almoſt conſtantly terminate in a ſtiff joint, owing, as is ſuppoſed, to the callus forming in too great quantity, and to its finding acceſs to the cavity of the joint. I have not found, however, that fractures of this bone are ſo apt to produce ſtiff joints as

we are led to expect. In different inſtances which I have had of them, ſcarcely any degree of ſtiffneſs remained in any of them after three or four months: and when any permanent affection of this kind does take place, I cannot imagine that it proceeds from ſuperabundancy of callus, as the quantity which ſuch a ſmall bone will afford, muſt be extremely trifling. It rather ſeems to originate from the inflammation with which theſe fractures are uſually accompanied affecting the internal parts of the joint; or from the knee being kept too long in an extended immoveable poſture. From a dread of ſeparating the fractured parts of the bone before they are firmly united, the leg is uſually preſerved in an extended poſture for ſix, eight, or perhaps ten weeks; a much longer period than is neceſſary, and by which alone even the ſoundeſt joint would be apt to become ſtiff and immoveable.

In the treatment of fractures of this bone, in whatever direction they may run,

run, the leg ſhould be extended, in order to relax the only muſcles with which it is connected, thoſe forming the ligament inſerted into it. With this view, the patient ſhould be placed upon a bed rendered ſo firm that it will not yield during the courſe of his confinement; a precaution particularly neceſſary in all fractures of the lower extremities, where long confinement to bed is almoſt always neceſſary, and where unequal ſinking of the body is often the ſource of much uneaſineſs to the patient, and may be the cauſe of a ſeparation of the newly replaced bones.

This being done, a long firm ſplint of timber, thickly covered with ſoft wool, or with ſeveral plies of fine flannel, ſhould then be placed beneath the thigh and leg, from the upper part of the one to the extremity of the other; and to this the limb ſhould be ſecured by two ſtraps between the ankle and knee, and one or two between the knee and top of the thigh. This will effectually preſerve the leg in a ſtate of

of extenſion; and it does it in the eaſieſt manner when the ſplint is ſufficiently broad and properly covered in the way we have mentioned.

The different parts of the fractured bone are now to be brought as nearly together as poſſible with the hand; but no bandage is yet to be applied to them. Our great object at firſt is to prevent inflammation; for which purpoſe as much blood ſhould be taken from the joint by means of leeches as the patient can properly bear; and for two or three days, or as long as much pain, ſwelling, or tenſion continue, ſaturnine and other aſtringent applications ſhould be uſed for removing them.

This being accompliſhed, we again examine the ſtate of the bone; and if the different parts of it be all as nearly in contact as is neceſſary, they ought not to be diſturbed. The joint may be covered with a large pledgit of Goulard's cerate, by which it will be kept ſoft and eaſy;

eaſy; and a hooped frame ſhould be employed to ſupport the bed cloaths.

But if the different parts of the bone, inſtead of being nearly in contact, are found ſeparated to any conſiderable diſtance, it becomes neceſſary, in the firſt place, to replace them, and afterwards to retain them with bandages as far as this can with propriety be done.

In a longitudinal fracture of the patella, this is eaſily accompliſhed; for in this direction we meet with little reſiſtance in replacing them, and they are eaſily retained with very moderate preſſure, either with the common uniting bandage, or with ſlips of leather ſpread with glue or adheſive plaſter. But in tranſverſe fractures of this bone, as that portion of it connected with the extenſor muſcles of the thigh is apt to be drawn forcibly upwards, we cannot always replace it; or if this is practicable, it cannot always be retained in contact with the inferior portion, but by a force that would

would excite pain, ſwelling, and inflammation.

It is a fortunate circumſtance, however, that it is not abſolutely neceſſary to a complete cure, that the different pieces of bone be kept in exact contact. Where it can be eaſily done, it ought always to be put in practice; but I know from the reſult of ſeveral caſes where this was impracticable, that a cure may be obtained, and the joint be equally firm and uſeful as it was before, even although the ſeparated portions of bone cannot be brought within an inch of each other. We ſhould not therefore be very anxious about this; and inſtead of uſing much force for the purpoſe of drawing the bones into cloſe contact, no more ſhould be employed than the patient can bear with perfect eaſe.

Various bandages have been invented for drawing the divided parts of a fractured knee-pan together; but all of them have been formed upon erroneous principles. They are made to preſs equally upon

upon the upper and under portion of the bone: whereas the leaſt reflection on the anatomical ſtructure of the parts muſt render it obvious, that no advantage can be derived from much preſſure on the inferior part of the bone, which always remains in its natural ſituation; and therefore, that any force we employ ſhould be almoſt entirely applied to that part of it connected with the ligament of the extenſor muſcles; by the action of which, particularly of the rectus muſcle, this portion of the bone is drawn upwards.

In Plate LXXIII. a bandage is repreſented; from which, while it ſits eaſily upon the parts to which it is applied, every advantage which can be expected from this kind of aſſiſtance may be derived. It conſiſts of two circular ſtraps, A B, of firm leather, lined with ſoft flannel, with two perpendicular ſtraps C E, that paſs from one to the other, and a ſemilunar firm compreſs G; with another ſtrap of a greater length D, reaching from

from the point of the toes to the buckle on the upper circular round the thigh, as is more particularly repreſented in fig. 3. of the ſame Plate.

The leg being extended and elevated to a proper height for relaxing the extenſor muſcles of the thigh, the upper edge of the under circular ſtrap A ſhould be applied to the under part of the inferior portion of the bone, ſo as to ſupport it in its natural ſituation without forcing it further up. The ſtrap muſt be then buckled to ſuch a degree of tightneſs as the patient can eaſily bear it; and the upper half of the bone being pulled gently downwards, the ſemilunar compreſs F in fig. 3. muſt be applied round the upper end of it, when the upper circular ſtrap muſt be alſo buckled. By means of the two perpendicular ſtraps and buckles, we now make an eaſy gradual extenſion, which will not move the under circular if it be made ſufficiently tight; but which will draw the other downwards if it be not made too tight, which we ought carefully to endeavour to avoid. This will,

in ſome degree, draw down the upper part of the bone, by gently pulling down the compreſs previouſly applied to the upper end of it; but it will be more effectually done by the ſtrap D made ſufficiently tight by fixing it to the correſponding buckle in the upper circular ſtrap B.

In this manner the different parts of the bone may be made to approach each other as far as this can be done with propriety; but for the reaſons already mentioned, the preſſure ſhould never be carried ſo far as to endanger the excitement of pain, inflammation, or ſwelling.

The limb being ſecured in the manner we have mentioned, the bandages ſhould not be removed till the twelfth or fourteenth day, if pain and inflammation do not render a more early removal neceſſary. But about this period the joint ſhould be expoſed, when the limb may be moderately bent; and this being cautiouſly repeated every ſecond or third day, no interruption will be given to the cure, while the motion of the joint will be

effectually preſerved; which it ſeldom or never is when this piece of attention is neglected.

There is another injury to which the joint of the knee is liable; ſo ſimilar in its effects to the one we have been conſidering, and in the mode of treatment, that I think it right to mention it here; namely, a ſeparation, by external violence, of the ligament or tendon of the rectus muſcle from the patella. The uſual effect of a ſmart ſtroke, or a ſevere fall, upon the fore-part of the knee, is a fracture of the patella: but where a perſon carrying a heavy burden upon his back, falls with his knee much bent, a rupture of the tendon is a more frequent conſequence; at leaſt I have met with three caſes of this accident from this cauſe, in which the tendon, after ſeparating from the bone, retracted to the diſtance of two or three inches.

The treatment we have adviſed for a fracture of the patella proves equally ſucceſsful here: Only it will be under-

ſtood, that in this caſe no advantage can be obtained from pulling down the retracted tendon: for no part of the bone being connected with it, we cannot lay hold of it; ſo that we have to truſt ſolely to the extended poſture of the limb. But although the tendon and bone cannot be brought cloſe to each other, yet a cure may always be accompliſhed in the manner we have mentioned.

SECTION XIII.

Of Fractures of the Bones of the Leg.

IN fractures of the leg, one bone only is often broken, but a fracture of both is more frequent. In this caſe the ſeat, as well as the direction, of the fracture are readily diſcovered. When one bone only is broke, theſe are diſcovered

with more difficulty. This, however, is of no great importance; for when one of the bones remains entire, it ſerves ſo effectually to ſupport the other, that nothing is neceſſary for effecting a cure but confinement till the fractured bone be united.

Fractures are more frequent near the joint of the ankle than in other parts. We find a great proportion of fractures of the fibula ſeated an inch or two above the under extremity of this bone, this being the weakeſt part of it.

In the management of a fractured leg, the ſame general principles apply which we adviſed in the treatment of a fractured thigh-bone. In replacing the bones, the muſcles of the limb ſhould be as much relaxed as poſſible; and we do it in the moſt effectual manner by bending the joint of the knee and ſlightly extending the foot. When the leg is in this poſition, there is ſeldom much difficulty in putting the bones into their natural ſituations; and with no more extenſion

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PLATE. LXXIV.

FIG. 1.

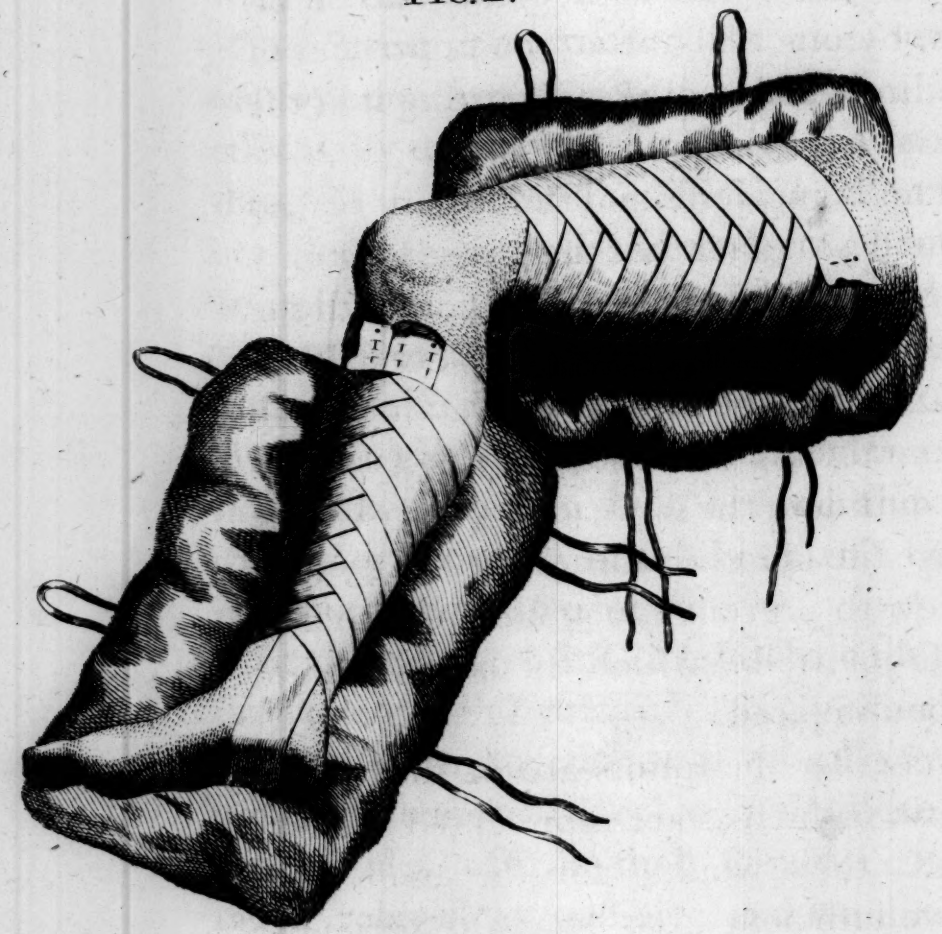
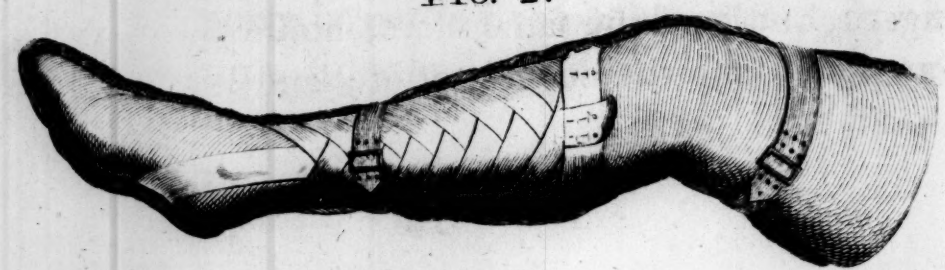


FIG. 2.



tenſion than can with great eaſe be given, by one aſſiſtant at the upper end of the limb, and another ſupporting it at the ankle.

This being done, and the patient placed in ſuch a manner that the injured leg may with eaſe be laid upon its outſide, with the knee bent, the ſplints, figs. 3, 5, or 6, Plate LXX. ſhould be applied and retained with the twelve-tailed bandage; the ſplint on the outſide of the leg reaching from a little above the knee to beneath the ankle, with a view to prevent the motion of either of theſe joints, by which the bones are apt to be diſplaced.

Whether the ſplints are of firm paſte-board, or ſuch as are repreſented in Plate LXX. they would, for the moſt part, prove ſufficient: but when the patient is either very reſtleſs, or troubled with ſpaſmodic affections of the muſcles of his leg, an additional ſplint of wood, ſhaped to the form of the leg, as is repreſented in figs. 1, and 2, of the ſame plate, ſhould be applied along the outſide of it; and,

if it be ſlightly excavated and filled with ſoft-wool, it ſits with perfect eaſe, while it prevents, with the utmoſt certainty, the ends of any of the bones from falling downwards. It is fixed with any degree of tightneſs by two ſtraps and buckles. The leg, when dreſſed in this manner, has the appearance repreſented in Plate LXXIV. fig. 2.

We have already obſerved, that after the dreſſings are applied, the leg ſhould be laid upon its outſide, with the knee bent, and the foot ſhould be ſomewhat ſupported by a turn of a bandage, as repreſented in the figure juſt mentioned. The intention of this is to relax the muſcles of the limb; by which the patient lies with more eaſe, while the bones are leſs liable to be diſplaced, than where the muſcles are kept fully ſtretched out, as was almoſt the univerſal cuſtom till very lately.

But although it is proper to place the leg in ſuch a poſture as tends moſt effectually to relax all the muſcles; yet the knee

knee ſhould not be more bent than is neceſſary for this purpoſe: for when the joint is much curved, it is almoſt equally irkſome to the patient as when the leg is fully ſtretched out. The knee ſhould not therefore be more bent, nor ſhould the patient be laid more towards the affected ſide, than is juſt neceſſary for allowing the leg to be placed upon its outſide.

There are ſome patients, however, who, from long cuſtom, as well as from other cauſes, cannot reſt when lying on either ſide; and ſome practitioners think, that fractures of the leg mend better when the patient is laid upon his back, and the limb placed upon the gaſtrocnemii muſcles, with the toes upwards. In ſuch caſes the patient may be placed upon his back, and yet the curved poſition of the leg retained. This may be done in different ways; but the eaſieſt method is, by raiſing the leg, and ſupporting it upon a frame, at a proper height above the level of the body. This admits

mits of the limb being placed in the poſture we have mentioned, and with any neceſſary degree of curvature.

Even where a fractured leg is placed on the outſide, it is a pleaſant variety to the patient to have the poſture altered; and by means of ſuch a frame it can be eaſily done.

A limb placed in this ſituation is repreſented in Plate LXXX. fig. 2. This variety of poſture is even admiſſible in fractures of the thigh. The patient may from the firſt be placed with his leg curved in the manner here repreſented; or he may afterwards turn upon his back, and the cure be completed while he remains in this poſture, or he may alternately change from one to the other. The inconveniency uſually complained of, from the leg reſting upon the heel when it is ſtretched out, is avoided by an excavation or opening made in the bottom of the frame for receiving the heel; or it may be done by allowing the heel to project over the edge of the frame altogether.

altogether. No change of poſture, however, ought to be permitted for the firſt ten or twelve days. About this time the patient may be turned with caution upon his back, and the leg moved from one poſition to the other, care being taken to preſerve it in the ſame degree of curvature.

In fractures of the leg where the fibula only is injured, it is apt to paſs unnoticed, and to be conſidered as a ſprain of ſome of the muſcles: But as very ſerious conſequences are apt to enſue from this miſtake, it ought to be ſtrictly guarded againſt.

When treating of fractures of the clavicle, we had occaſion to mention an appearance which, of itſelf, is extremely ſimple and of eaſy treatment; but which, from want of attention to the cauſe of it, has often been productive of much perplexity both to patients and practitioners; I mean what is commonly termed the Riſing End of a Bone: and as this

frequently occurs in the leg, I think it proper to mention it here.

When the bones of the leg are broke directly acroſs, they ſometimes ſerve to ſupport each other ſo effectually that neither of them are diſplaced. In ſuch circumſtances no inequality appears in the limb, if it be not from ſome temporary ſwelling of the ſoft parts. But when both bones are fractured, and at the ſame time diſplaced, the under extremity, or that portion connected with the foot, is almoſt always drawn towards the back part of the leg; by which an unequal prominency is produced by the projecting end of the upper portion of bone, or that part of it which ſtill remains connected with the knee.

It is this which in general is termed the Riſing End of the Bone: and in reducing ſuch fractures much pains has often been taken to force a bone in this ſituation into contact with the others. It is obvious, however, that it is not the upper part of the bone which riſes, but the


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PLATE LXXV.

FIG. 1.

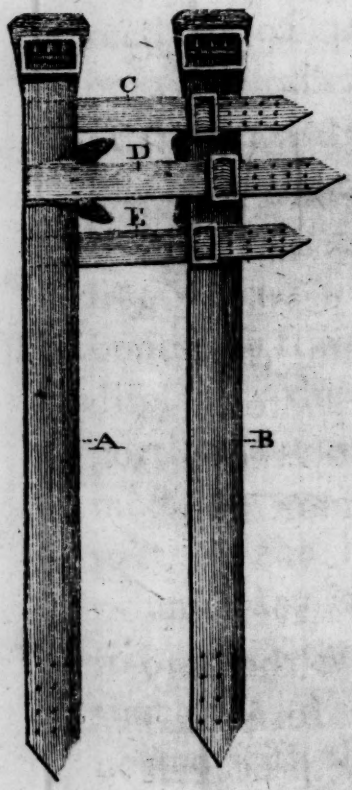


FIG. 2.

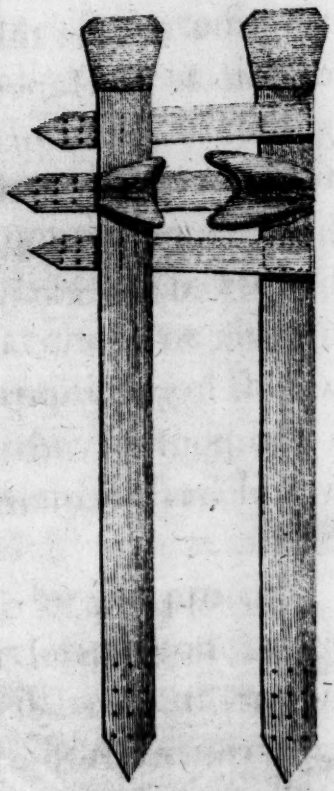
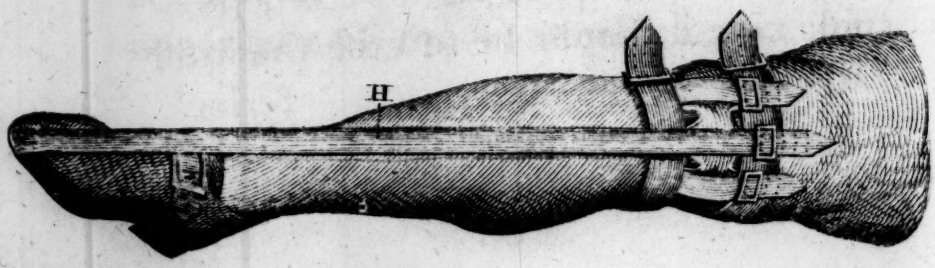


FIG. 3.



the inferior portion which falls, or is drawn out of its natural ſituation by the weight of the foot, as well as by the contraction of the muſcles on the back part of the leg: Hence no advantage can be gained by any preſſure made upon the ſuperior part of the bone, while much harm may be done by it; as has often happened by bandages being put ſo tight upon it as to cut all the teguments with which it was covered; and thus forming a compound fracture of what otherwiſe would have remained of the moſt ſimple kind.

The upper part of the bone never riſes out of its natural ſituation; ſo that any inequality that occurs on the form and appearance of the leg muſt be produced in the manner we have mentioned, namely, by the inferior portion of the bones being drawn out of the ſituation which they ought to occupy: ſo that in our treatment of ſuch affections, inſtead of forcing down the upper part of the bone, our ſole object ſhould be to raiſe the inferior

ferior part of it, ſo as to bring them into contact; and by ſupporting it in this ſituation, to endeavour with as much certainty as poſſible to effect their reunion. In this manner a cure may be often accompliſhed, which would not in any other way have been practicable.

SECTION XIV.

Of Fractures of the Bones of the Foot and Toes.

THE foot is very liable to injuries of this kind from a variety of cauſes; but particularly from its being more expoſed to bruiſes than other parts of the body.

Fractures of theſe bones are diſtinguiſhed in the ſame manner with fractures of other parts. We judge that one or other of them may probably be fractured

red when the foot has been violently bruiſed; and we diſcover with certainty that it is ſo by the grating of the fractured parts when they are rubbed againſt each other.

Fractures of the bones of the foot and toes are to be managed nearly in the ſame manner with ſimilar injuries of the hands and fingers. Any portion of bone that is diſplaced muſt be put into its natural ſituation with as much exactneſs as poſſible; and we endeavour to retain it by a ſplint fitted to the form of the part ſupported with different turns of a roller. When any of the bones of the foot are fractured, a large ſplint ſhould be applied over the ſole ſo as to ſupport the whole of it; and no freedom ſhould be permitted in the motion either of the foot or ankle during the cure, for nothing tends more to diſplace a fractured portion of bone than the action of contiguous muſcles.

SECTION

SECTION XV.

Of Compound Fractures.

AS the term Compound Fracture has been applied to injuries of different kinds, I think it right to define with preciſion the meaning I wiſh to affix to it. A fracture of a bone communicating with an external opening or wound in the correſponding teguments, I denominate a Compound Fracture. It is not the circumſtance of a fractured bone occurring with a wound in the contiguous ſoft parts that conſtitutes a compound fracture: This may happen with a fracture of the moſt ſimple nature. Unleſs the external opening communicates with the fracture of the bone, the nature of the injury is not affected by it, even although

though the wound be extenſive; while the ſmalleſt puncture paſſing directly to the ſubſtance of a fractured bone, adds much difficulty to the method of cure, and hazard to the event.

Compound fractures are produced by external violence, and frequently by the bones, in caſes of ſimple fractures, being puſhed through the correſponding teguments. In ſome caſes, this happens from a bone being fractured ſo very obliquely as to terminate in a ſharp point; while in others it is an evident effect of too tight a bandage, applied with the improper view, as we have ſeen in one of the preceding ſections, of bearing down the upper end of the fractured bone. But in whatever way a compound fracture is produced, the conſequences reſulting from it are nearly ſimilar. The admiſſion of air to a fracture adds evidently to the riſk attending it; and whether this takes place as an immediate effect of external violence, or as the conſequence of preſſure upon the ends of the bone, no difference

is

is perceptible in the effects which reſult from it.

Various reaſons might be adduced to prove that it is the admiſſion of air alone which renders compound fractures more hazardous than others. We may ſhortly mention, however, one of the moſt obvious proofs of it. The worſt variety of ſimple fracture, where the bone is broke in the moſt oblique manner, and where it is difficult or perhaps impoſſible to retain it in its ſituation, will continue to do well, and to excite no ſevere ſymptom, as long as the ſkin remains entire: But if, by any accident, the point of the bone is puſhed through the teguments, from that moment the pain becomes more ſevere; the inflammation, which before perhaps was trifling, becomes now conſiderable; fever takes place; the limb is apt to be attacked with violent ſpaſmodic twitchings; and to theſe there frequently ſucceeds either gangrene or extenſive ſuppurations.

In compound fractures, our firſt object

ject is to reſtrain profuſe hemorrhagies when they take place, by a proper application of the tourniquet: Our next is to conſider, whether we are to attempt to ſave the limb, or to recommend immediate amputation.

From the difficult treatment and uncertain event of compound fractures, practitioners have been very univerſally diſpoſed to conſider the amputation of the fractured limb as indiſpenſably neceſſary. At all times indeed individuals have oppoſed this general opinion. Among others, Mr Bilguer of Berlin wrote on this ſubject; and he aſſerts, that amputation is ſcarcely ever requiſite, and that a greater number of patients would recover by proper treatment than by the operation.

To me it appears that both opinions are in the extreme; and that they have been formed without that attention to, and diſcrimination of, circumſtances, which the importance of the queſtion required.

In

In private practice, where patients can be kept quiet and perfectly at reſt from the date of the injury, and where proper attention can be inſured on the part of the practitioner, as well as of experienced nurſes, compound fractures ſhould receive a different treatment from thoſe that happen in a field of battle or in an engagement at ſea. There are ſo many inſtances in which, from amputation being objected to by the patient, from the limb being too much ſwelled or inflamed before aſſiſtance was called to allow of its being performed, or from intention on the part of the practitioner to endeavour to ſave the limb, of cures being made, that I am now convinced that immediate amputation ſhould never be adviſed in private practice, unleſs when the bones are ſo much ſhattered that they cannot reunite; or where, from the violence of the injury, the texture of the ſoft parts is completely deſtroyed.

On the other hand, I am ſatisfied that it would be a good general rule, both in the navy and army, to amputate immediately in every caſe of compound fracture received in battle, where the accident is either in the humerus or thigh, or where both bones of the fore-arm or leg are broke. In this ſituation, the patient is expoſed to a variety of hardſhips which tend to aggravate his danger; and no accommodation can be procured nor attention given to leſſen it.

In oppoſition to this it may be alleged, that many cures of compound fracture are daily made in military hoſpitals. Indeed this is the argument on which Mr Bilguer reſts his opinion: but, like every prejudiced inquirer, he ſtates it partially.

I readily admit, as every one accuſtomed to the treatment of fractures will do, that cures are ſometimes unexpectedly accompliſhed under the moſt untoward circumſtances: But the favourable termination of a few caſes ought not to

invalidate a rule of ſuch conſequence as this, which is founded on the ſure baſis of experience and obſervation.

When an officer of rank and fortune receives a compound fracture, and where circumſtances admit of his being ſoon conveyed to comfortable quarters, with a proſpect of his remaining there during the cure, the caſe muſt be a bad one if we do not attempt to ſave the limb. But caſes of this kind are not in the uſual routine of military practice; and I mention them particularly, becauſe the accounts we have received of the ſucceſs of the practice inculcated by Mr Bilguer, are chiefly, if not entirely, drawn from ſuch inſtances; and they therefore afford no concluſion relative to military and naval practice in general.

Even in private practice, I am far from thinking that our attempts to ſave fractured limbs will always ſucceed. I know they will not; and, in the courſe of much buſineſs, that caſes will occur in which the beſt conducted meaſures will fail,

fail, particularly where the large joints are much injured, and where the long bones are not only fractured but broke into ſplinters in different places: But I know from experience, that in a great proportion of the whole we will prove ſucceſsful; and that in thoſe caſes in which we are at laſt obliged to adviſe amputation, more will recover than probably would have done if the operation had been performed ſoon after the accident: at leaſt this has been very commonly the caſe in the courſe of my obſervation. Of thoſe who have died ſoon after the operation, either from the fever induced by the extenſive wound; from the great and ſudden change produced in the circulating ſyſtem by the removal of a conſiderable part of the body; or from the perturbation and violent agitation of ſpirits which the unexpected loſs of a limb muſt always induce, a great proportion has been of thoſe caſes where the operation was performed as quickly as poſſible after the accident. In theſe the various cauſes

we have mentioned concur to render the ſubſequent fever, and every concomitant ſymptom, more violent than we commonly find them in patients who have been reduced by confinement and a low regimen, and who, from having full leiſure to reflect upon the danger of their ſituation, are, from their own conviction of its being neceſſary, very readily induced to ſubmit to the operation.

A patient may indeed be brought ſo low as to make the ſucceſs of the operation doubtful from this cauſe alone: But a practitioner may always guard againſt this by propoſing the operation when his attempts to ſave the limb prove abortive, and when the patient's ſtrength declines.

Amputation proving more ſucceſsful in the more advanced ſtages of compound fractures than when practiſed immediately after the accident; and in the more advanced ſtages of chronic affections, particularly in white ſwellings of the joints, as we have elſewhere remarked, than in the more early periods of them;

PLATE LXXVI.

FIG. 1.



FIG. 2.

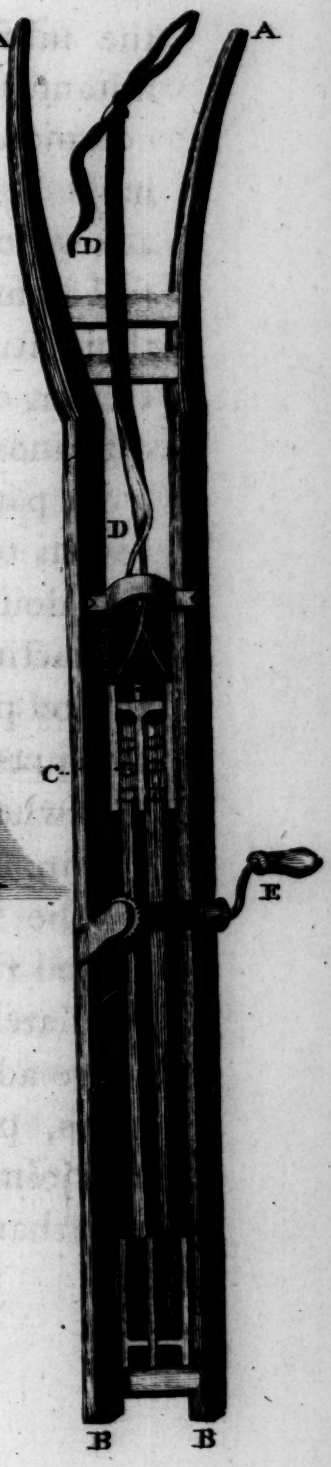
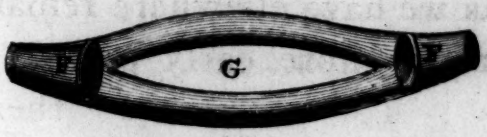
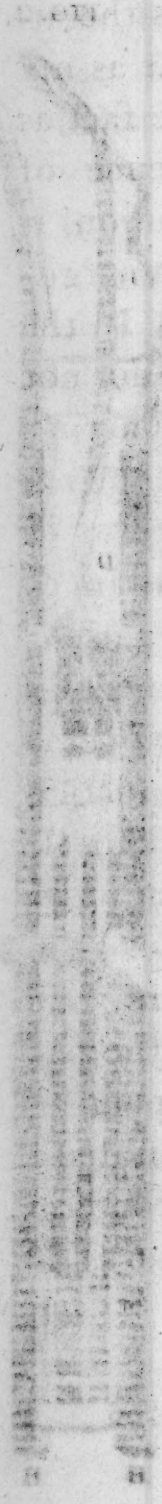


FIG. 3.





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them; is a point which merits the attention of practitioners. So far as my obſervation goes, I conſider the fact as aſcertained; and if the experience of others leads to the ſame concluſion, it will prove the moſt convincing argument againſt early amputation. In the courſe of my own experience, I do not recollect an inſtance of death occurring from the operation alone, where the affection for which it was adviſed was of ſome duration; and in ſeveral inſtances it has been performed where the patient was very much exhauſted: Whereas ſeveral have died merely from the operation, where it has been put in practice ſoon after the accident. When I ſpeak of death as the conſequence of the operation, I do not mean ſuch inſtances of it as occur from hemorrhagies breaking out in the courſe of a ſhort time after the patient is laid in bed, as theſe may happen at whatever period a limb may be amputated; but ſuch as take place about the ſecond or third day, and in ſome inſtances at a la-

ter period, from the violence of the fever induced by and commencing ſoon after the operation.

When amputation is not performed immediately, or ſoon after the injury is received, it is agreed upon all hands, that it cannot, for ſeveral days at leaſt, be admiſſible. Different cauſes may afterwards render it neceſſary.

1. Hemorrhagies under certain circumſtances.

2. Extenſive mortification.

3. The ends of the fractured bones remaining long diſunited, while a copious diſcharge of matter endangers the ſinking of the patient's ſtrength.

When hemorrhagies take place immediately, we have it always in our power to command them, either by compreſſion alone, or by enlarging the wound when it is too ſmall, and ſecuring the bleeding arteries with ligatures. Sometimes, however, when no diſcharge of importance occurs at firſt, profuſe hemorrhagies will take place at the end of ſeveral days. It

may

may be difficult in ſome caſes to account for this; but we can frequently trace it to the effect of friction; the coats of an artery being deſtroyed by beating or rubbing upon the ſharp edge of a ſplintered bone.

Even in this advanced ſtate of the injury we may frequently be able to ſecure the wounded arteries with ligatures. But the limb is ſometimes ſo much ſwelled and inflamed before the hemorrhagy appears, that the original opening will not admit of this; and on proceeding to enlarge it, ſuch confuſion is met with from effuſed coagulated blood between the interſtices of the muſcles, as well as through the whole cellular membrane of the affected parts, that the divided arteries cannot be all brought into view, but by ſuch extenſive inciſions as in this ſtate of the parts would be attended with more hazard than amputating the limb at a proper diſtance above: and although it is not a common occurrence, yet inſtances happen where the moſt expert ſur-

geons are obliged in this ſituation to amputate.

Mortification is the ſecond motive we mentioned for amputating in this ſtage of compound fractures; and, when it takes place to any conſiderable extent, it muſt be allowed that it is a very powerful one. We ſhall have occaſion to conſider this ſubject, however, more particularly when we treat of amputation; and with reſpect to the third cauſe we mentioned, when the bones do not unite, and when the patient declines under a copious diſcharge of matter, no practitioner of experience will, in this ſituation, diſpute the propriety of amputation.

It is this ſtate of a compound fracture, when the original inflammatory fever excited by the injury is ſubſided, and before the patient is too much weakened by the diſcharge, which of all others we conſider as the moſt favourable for amputation. The exact time cannot poſſibly be fixed by any general obſervation.

tion. It muſt depend upon the particular circumſtances of every caſe, and chiefly upon the quantity of the diſcharge and ſtrength of the patient; and theſe again are points which the judgement of the practitioner in attendance can alone decide upon. We may remark, however, that as long as the patient does not ſeem to be much hurt by the diſcharge, however great it may be, the operation ſhould not be adviſed; for while his ſtrength is not much impaired, we may with ſafety proceed in our endeavours to ſave the limb.

From what has been ſaid, it will appear, that, in private practice, very few caſes can occur of compound fractures, in which we ſhould not attempt to ſave the limbs.

In the treatment of compound fractures, our object is the ſame as in the management of thoſe of the moſt ſimple nature; namely, the replacing of any bones that may be deranged, and retaining them till they are united.

In

In the firſt place, all extraneous bodies ſhould be removed, as well as all thoſe ſmall pieces of bone that will not probably unite with the reſt; for which purpoſe the opening ſhould be enlarged with a ſcalpel, if it be too ſmall to admit of their being eaſily taken out. And this being done, we will in general find it an eaſy matter to replace the bones if we relax all the muſcles of the injured limb in the manner pointed out in the preceding ſections of this chapter. There is juſt one exception occurs to this: A ſharp point of a bone is, on ſome occaſions, ſo far puſhed through the teguments, that it cannot be replaced by any ordinary force; and to a certain extent, the greater the force that is applied to it, it is the more firmly fixed between the ſkin and parts beneath. In ſuch caſes there are two methods by which the difficulty may be removed: By ſawing off the end of the protruded portion of bone, or enlarging the wound.

When a long ſharp point of bone is much

much protruded, we ſhould not heſitate in removing it; for although it ſhould be reduced, it would not readily unite with the reſt of the bone, at the ſame time that it would be apt to excite much pain and irritation. When the portion to be taken away is very ſmall, it may be done with the cutting forceps uſually employed in amputations: but when it cannot be eaſily done in this manner, it may with ſafety be taken off with a ſaw; a piece of paſte-board, or of thin ſheet-lead, being previouſly inſerted between it and the teguments beneath.

But whenever the protruded portion of bone is broad at the baſe, and not of any conſiderable length, as there will be cauſe to hope that it will unite with the reſt of the bone if they be brought rightly into contact, we ought certainly to endeavour to ſave it; and in general we will be able to do ſo by enlarging the opening through which it has paſſed. If we take care to avoid any large blood-veſſels and nerves, which thoſe acquainted with the anatomy

anatomy of the parts will readily do, no danger will occur from the operation. Inſtead of adding to the danger of the patient, it tends often to leſſen it, by removing a powerful cauſe of pain and irritation, and thus preventing that inflammatory tenſion to which limbs in this ſituation are particularly liable.

To thoſe not much accuſtomed to treat compound fractures in this manner, the practice we now recommend may be ſuppoſed to be attended with hazard; and to convert a ſmall puncture into an extenſive wound, may often appear to be cruel and unneceſſary. But as the admiſſion of the air has already occaſioned all the miſchief which can ariſe from this quarter, we do not thus increaſe the danger of the patient; and it is generally well known, that a free inciſed wound heals more readily than a ſmall punctured one. It is the ſkin only which, in moſt caſes, we have to cut here: But even where the bone cannot be eaſily reduced without carrying the inciſion in-

to

PLATE LXXVII.

FIG. 1.

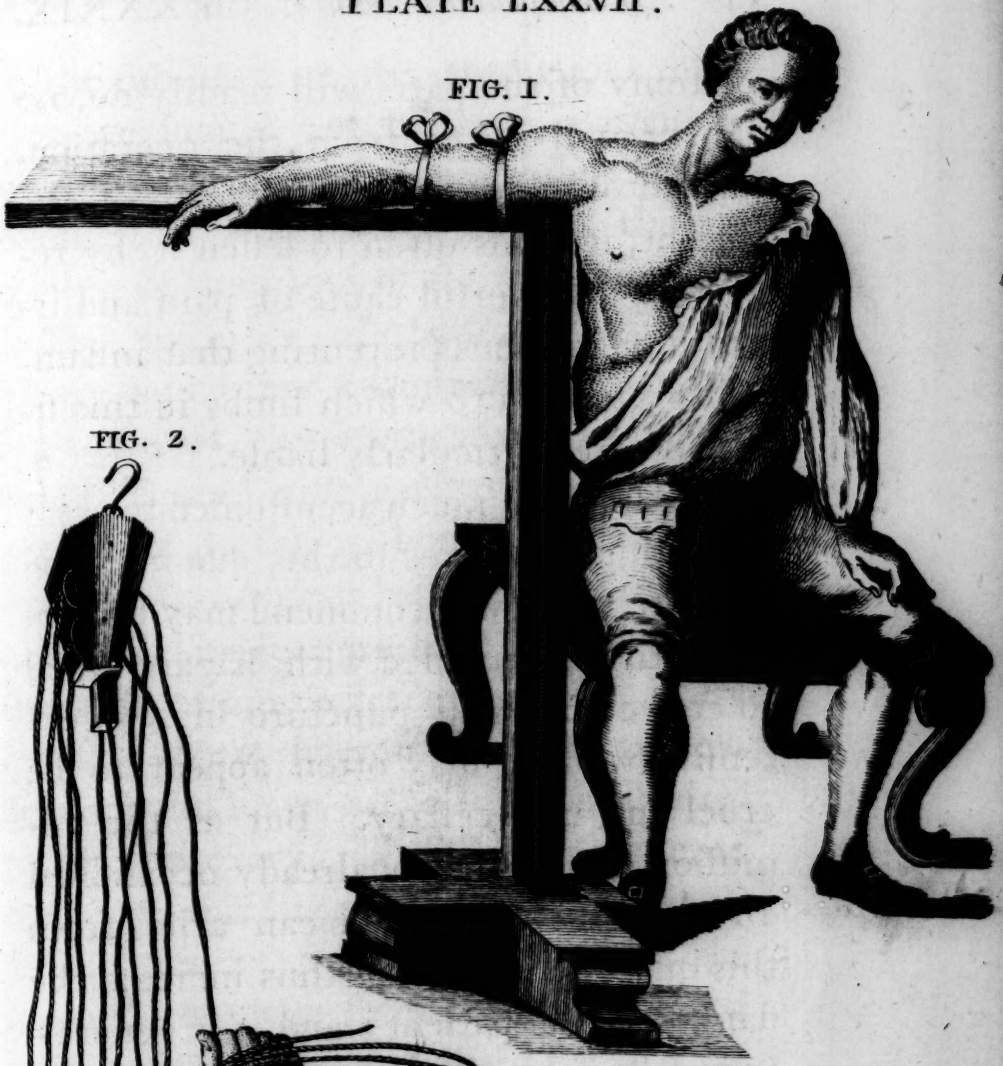
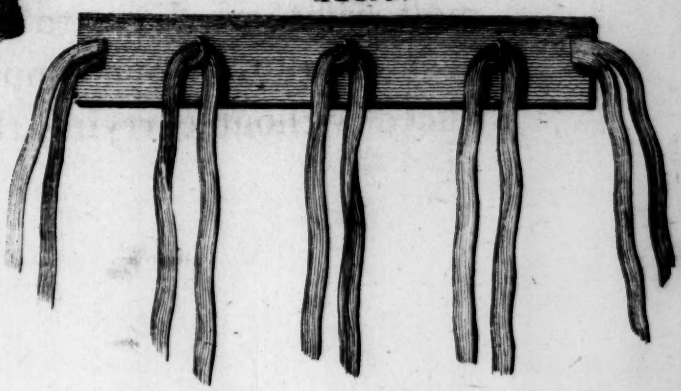
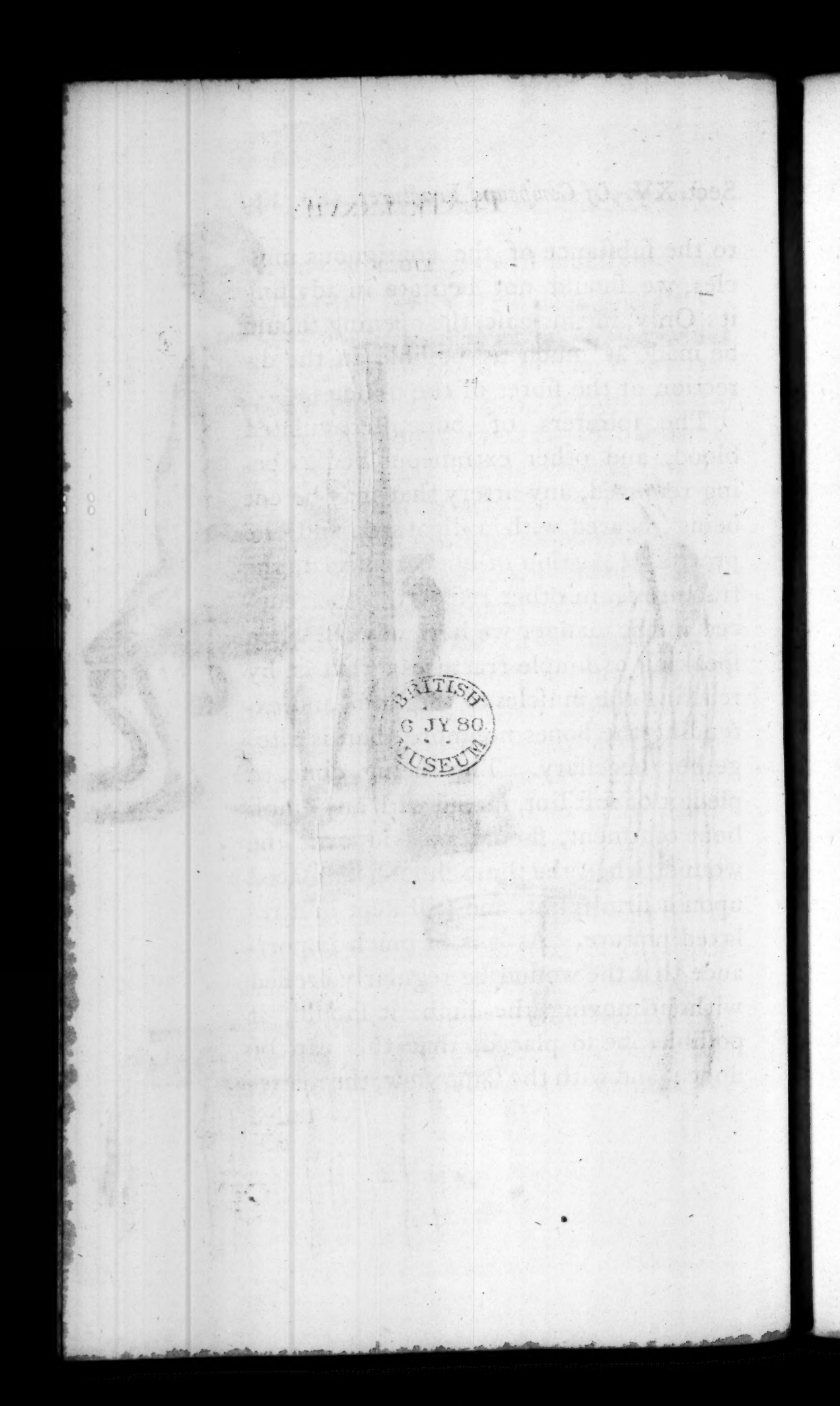


FIG. 2.



FIG. 3.




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to the ſubſtance of the contiguous muſcles, we ſhould not heſitate in adviſing it: Only, in this caſe, the opening ſhould be made as much as poſſible in the direction of the fibres of the muſcles.

The ſplinters of bone, coagulated blood, and other extraneous bodies being removed, any artery that may be cut being ſecured with a ligature, and the protruded portion of bone replaced, the fracture is, in other reſpects, to be reduced in the manner we have adviſed when ſpeaking of ſimple fractures; that is, by relaxing the muſcles of the limb, and extending the bones no more than is altogether neceſſary. This being done, a pledgit of ſoft lint, ſpread with any emollient ointment, ſhould be laid over the wound, when the limb ſhould be placed upon a firm ſplint, and ſtill kept in a relaxed poſture. As it is of much importance that the wound be regularly dreſſed without moving the limb, it ſhould, if poſſible, be ſo placed, that this can be done; and with the ſame view, the many-

tailed

tailed bandage, in every inſtance of compound fracture, where it is any reſpect applicable, ſhould be preferred to the roller.

As it is a point of the utmoſt importance to place the limb in ſuch a poſture as will admit of the ſore being dreſſed without moving it, various inventions have been propoſed for rendering this in every caſe practicable. Very few of theſe, however, have anſwered the purpoſe for which they were intended. The beſt I have met with is a fracture-box invented by the ingenious Mr James Rae of this place; of which, with ſome improvements made by his ſon Mr John Rae, I now give a delineation. The leg may be laid in it either bent or ſtraight, and a wound, wherever ſituated, may be dreſſed without altering the poſition of the limb, as will be more clearly underſtood from the repreſentation of the inſtrument, Plate LXXIII. fig. 3.

In whatever ſituation the limb be placed, it is an object of the firſt import-

ance

ance to endeavour to prevent inflammation: for when mortification enſues, it may be almoſt always traced to too great a degree of inflammation; and the ſame cauſe very often gives riſe to thoſe extenſive abſceſſes with which fractures of this kind are apt to be accompanied. We are therefore from the firſt to guard againſt the acceſſion of this ſymptom; by one or more general blood-lettings, proportioned to the ſtrength of the patient; by the application of leeches to the edges of the ſore, when the inflammation becomes ſevere; by the uſe of opiates; by gentle cooling laxatives; a low regimen; and other parts of an antiphlogiſtic courſe. The dreſſings ſhould be removed once or twice daily, according to the quantity of matter; and inſtead of dry lint, pledgits of any emollient ointment, or Goulard's cerate, will be preferable: for I have not found in any ſtate of theſe ſores that ointments do harm; and they always ſit eaſily, and

are more eaſily removed than when dry lint is applied alone.

Warm emollient poultices are very commonly applied at firſt, and continued for a good many days. But as they prove always troubleſome, and cannot be removed without in ſome degree altering the poſture of the limb, I think it better to avoid them till we ſee whether or not they become neceſſary by the approach of inflammation. In that event they ſhould be immediately employed as the ſureſt means of exciting a diſcharge of matter: For although we would rather wiſh the ſore to heal by what is termed the Firſt Intention, without the formation of matter; yet this being a very unuſual occurrence in wounds attending compound fractures, and a plentiful diſcharge of good pus being the moſt certain preventative of mortification, we ſhould not heſitate in endeavouring to promote it whenever a limb with a compound fracture is attacked with inflammation.

As ſoon, however, as our views are accompliſhed, by the inflammation ſubſiding, and a free diſcharge of pus excited, the poultices ſhould be laid aſide: for in many inſtances, when too long continued, they have certainly done harm, by relaxing the parts too much, and exciting too profuſe a diſcharge of matter.

When matter is diſcharged from a compound fracture in too great quantities, beſides laying aſide the uſe of emollient poultices, we ought to dreſs the ſore with gentle aſtringents, ſuch as ſoft lint dipped in a ſolution of ſaccharum ſaturni; and the patient ſhould now be ſupported with a nouriſhing diet, a free uſe of wine, Peruvian bark, and elixir of vitriol. A free vent ſhould be procured for the matter; and when this cannot be obtained by putting the limb in a proper poſture, it ſhould be done by making a counter opening in a more depending part. The neceſſity, however, of this may often be prevented by em-

ploying ſoft lint, or covering the ſore with ſoft ſponge to abſorb the matter, and by frequent dreſſings: for although the ſores ſhould never be more expoſed to the air than is neceſſary, yet whenever the diſcharge is copious, there will be more riſk from allowing the parts to be long immerſed in matter than from the moſt frequent renewal of the dreſſings.

When the diſcharge from a compound fracture becomes exceſſive, and cannot be leſſened by the means we have mentioned, it will often be found to originate from a portion of looſe bone that has not been earlier noticed. In ſuch circumſtances, therefore, we ſhould always examine the ſore with as much attention as poſſible; and wherever a piece of looſe bone is diſcovered, we ought to take it out either at the ſore itſelf, or by a counter opening if it appears that in this manner it can be more eaſily done. In making an examination for this purpoſe, the finger alone ſhould be employed

employed when the opening is ſo large as to give it acceſs: for in this manner we do leſs harm than with a probe; and at the ſame time we diſcover the real ſtate of the parts with more preciſion. When it is neceſſary to uſe a probe, it ſhould be done with caution, for much miſchief is frequently done where this inſtrument is employed too freely.

If, inſtead of producing a diſcharge of matter, the inflammation ſhould terminate in gangrene, the ſituation of the patient becomes ſtill more hazardous than under the moſt extenſive abſceſſes. We have elſewhere had occaſion to treat of the ſubject of gangrene; and we muſt now refer to that part of the work *. In a following chapter, we ſhall have an opportunity of mentioning the period, at which amputation of limbs, attacked with gangrene, ſhould be adviſed.

In conſidering this ſubject, ſome will ſuppoſe that I ſhould have given more particular directions for ſecuring fractured

* Vide Treatiſe on Ulcers, &c. Part I. Chap. III.

tured limbs in their ſituation, eſpecially in caſes of compound fracture: But as I know of no method of effecting this with ſuch certainty and eaſe as the one I have deſcribed, I conſider it as unneceſſary even to enumerate the various means that have been propoſed for this purpoſe. In particular circumſtances, thoſe we have deſcribed in the eleventh ſection of this chapter, Mr Gooche's machine, and Dr Aitken's, may prove uſeful for keeping the fractured bones extended; and much advantage may certainly be derived from them in keeping the bones ſteady when it is neceſſary to move a patient with a fractured limb from one part to another: but in ordinary practice, I can without heſitation ſay, that no advantage is derived from any inſtrument I have ever known uſed for this purpoſe.

CHAP. XL.

Of LUXATIONS.

SECTION I.

General Remarks on Luxations.

A BONE is ſaid to be luxated where that part of it forming a joint is diſplaced. In ſome caſes the end of a bone is forced entirely out of the cavity where it is naturally lodged: This we term a Complete Diſlocation. Where

any part of the bone reſts upon the edge of the ſocket, we ſay the Diſlocation is Incomplete.

Luxations may with the ſame propriety as fractures be divided into ſimple and compound. Where the end of a bone is merely diſplaced, we term it a Simple Luxation; but where this is accompanied with a correſponding wound in the ſoft parts, laying open the cavity of a joint, we ſay the Luxation is Compound. By ſome practitioners the term Compound is applied to diſlocations accompanied with fractures of the contiguous bones, whether the teguments be injured or not. We ſay with more propriety, however, that a luxation in ſuch circumſtances is of a Complicated Nature.

For the moſt part luxations are produced by external violence, and appear as the immediate conſequences of ſome conſiderable force applied to the injured parts. They are particularly apt to occur in leaping and falling, from blows,

and

and violent twiſts and diſtractions of the different bones of a limb: But they are alſo produced by other cauſes; by a morbid weakneſs or relaxation of the ligaments and muſcles of a joint, which ſometimes occur as the conſequences of palſy and long-continued rheumatic affections; and by the end of a bone being puſhed from the cavity in which it was lodged, by matter collected in it, or by ſarcomatous tumors and exoſtoſes.

Thoſe caſes of diſlocation that occur from external violence, are chiefly the objects of ſurgery. The ſymptoms uſually induced by theſe, are, inability to move the injured limb; pain, tenſion, and deformity in the part affected; and in ſome caſes inflammation, ſubſultus tendinum, and fever.

In general, the motion of the limb is impaired in proportion to the extent of the luxation; but in ſome caſes, even the moſt partial affection of this kind renders the joint perfectly ſtiff and immoveable, and creates the moſt exquiſite pain

on every attempt to move it. This is particularly the caſe in partial diſlocations of all the large joints.

The deformed or altered appearance of a joint, with which a luxation is always accompanied, muſt neceſſarily be in proportion to the extent of the injury; but this is not the caſe with the other ſymptoms we have mentioned: for ſubſultus tendinum, inflammation, and fever, are often excited to a greater height by partial diſlocations, where the ends of bones are not much moved from their natural ſituations, than where they are altogether forced from their ſockets, owing to a circumſtance which we ſhall preſently endeavour to explain.

The firſt approach of ſwelling in caſes of diſlocation is always of the inflammatory kind, and is a neceſſary effect of the violence done to the injured parts. This, however, ſhould be diſtinguiſhed from a ſecondary ſwelling to which theſe affections are liable, an extenſive tumefaction which in ſome caſes ſpreads over all

all the under part of the limb, and which ſeems to originate from a different cauſe. Inſtead of being red, tenſe, and painful, the teguments are pale, ſoft, and œdematous; owing, I ſuppoſe, to the lymphatic veſſels of the limb being compreſſed by the end of the diſplaced bone. Swellings of this kind are moſt frequent in diſlocations of the humerus and femur; in which alſo conſiderable numbneſs or diminiſhed ſenſibility is apt to be excited by the compreſſion of the nerves of the limb.

It is of much importance to diſtinguiſh diſlocations from other affections of the joints, and to aſcertain to what extent the bones are moved from their ſituations. In compound luxations the nature of the injury is obvious; and for the moſt part it is ſufficiently evident in caſes where bones are completely diſlocated; but partial diſlocations are often not to be diſcovered but by the moſt minute examination: They therefore frequently paſs unnoticed, or are conſidered as

ſprains

ſprains and contuſions; and thus, in caſes where complete cures might be performed by due attention on the part of the practitioner, patients are often rendered lame and miſerable for life.

The ſymptoms enumerated above are common to all diſlocations. In ſpeaking of particular luxations, we ſhall have occaſion to mention the peculiarities of each, and ſhall endeavour to do it in ſuch a manner as may with moſt certainty prevent ſuch unfortunate occurrences as we allude to.

In forming a prognoſis of the event of luxations; that is, of the practicability of reducing them, and of the termination of the ſymptoms with which they are attended; various circumſtances require attention: The form and ſtructure of the different joints; the nature and extent of the luxation, together with the degree of violence by which it was produced, and the circumſtances with which it may be complicated; and laſtly, the duration of the injury.

The

The ſkeleton is commonly had recourſe to for a knowledge of the joints; but although it is proper that every ſtudent ſhould be acquainted with the articulations in a dry ſtate, we ſhould by no means reſt ſatisfied with this. In the treatment of luxations, it is equally neceſſary that we have an exact knowledge of the joints in a recent ſtate: Of the cartilages, ligaments, and tendons, with which the bones are connected, as well as of the contiguous parts in which the heads of the diſplaced bones may happen to be lodged: Otherwiſe our ideas of the nature of theſe injuries, and of the means that will moſt probably prove ſucceſsful in the treatment of them, muſt be very imperfect.

We cannot enter upon a minute deſcription of every joint, as it would lead to an extent of diſcuſſion inconſiſtent with the nature of this work. Referring to the proper ſources for more particular information, we ſhall here only obſerve, that it is chiefly thoſe joints that

that are poſſeſſed of much motion in which we meet with luxations. Of theſe there are two varieties. The one termed the Junction by Ball and Socket, where the head or end of one bone is received into the cavity of another; and the other termed by anatomiſts Ginglimus, or the Hinge-like Joint, from its reſemblance to the hinge of a door. In this the joint is formed by different parts of one bone being received into cavities or indentations of another. The former admits of the moſt extenſive motion, as is exemplified in the joint of the humerus with the ſcapula, and in that of the femur with the oſſa innominata; while the latter does not admit of more than that of flexion and extenſion, as is the caſe in the elbow and knee. In theſe we accordingly find, that this more limited motion to which they are confined, renders them leſs liable to luxations; while the free motion of the others expoſes them to frequent injuries of this kind, as is more particularly the caſe in the joint

joint of the humerus, from the cavity in which the head of that bone is lodged being of no great depth.

Beſides the uſual coverings of teguments, muſcles, and tendons, in common to joints with the reſt of the body, every joint poſſeſſed of much motion is provided with what we commonly term a Capſular Ligament; which is a firm ſomewhat elaſtic ſubſtance, forming a kind of pouch or bag, which completely ſurrounds the articulation, and ſerves at the ſame time to retain the ends of the bones together, and to contain a thin tranſparent fluid, the ſynovia, for the purpoſe of lubricating the cartilages which cover the ends of the bones.

Practitioners are not agreed whether in caſes of luxation the capſular ligaments are ruptured or not. As it has appeared on diſſection in a few inſtances that the ligament was ruptured, ſome have concluded that it is the caſe in all; while others are of opinion, that the ligament always remains entire, except where

where the luxation has been the conſequence of very ſevere and unuſual degrees of violence.

The reſult of my obſervation on this point is, that partial luxations may happen without any rupture of the capſular ligament: but that it is always ruptured in complete luxations produced by external violence; nay, that it is often almoſt entirely tore from its inſertion round the neck of the bone. Where the head of a bone is gradually puſhed from its ſocket by the ſlow formation of a tumor within the joint, and where the ligament is perhaps much relaxed by diſeaſe, a luxation may no doubt happen without either rupture or laceration; but we cannot ſuppoſe that ſuch a firm ſubſtance as a ligament is in a ſtate of health, will yield, without burſting, to the ſudden impulſe produced by the complete diſlocation of the head of a bone, and where the diſplaced bone is in ſome caſes almoſt inſtantaneouſly forced to the diſtance of ſeveral inches from its

natural ſituation. Different inſtances are upon record of this opinion being ſupported by the diſſection of diſlocated joints after death; and were it neceſſary, I could add others that have fallen within my own obſervation.

We mentioned above, that the pain attending partial diſlocations is commonly very ſevere on any attempt being made to move the joints. For the moſt part, indeed, it is more exquiſite than it uſually is where the luxation is complete; and we conclude that it proceeds from the capſular ligament being overſtretched, and from the ends of the diſplaced bones continuing to act againſt it inſtead of paſſing freely through it.

In judging of a luxation, the diſtance to which the head of the diſplaced bone is forced, and the degree of violence by which it was produced, require particular attention. Where a bone is only partially diſlocated, although the pain attending it may be very acute, yet the reduction of it will be accompliſhed both

with

with more eaſe and certainty than if the ſame bone had been forced completely out of its ſituation. And where the joint has not ſuffered any extraordinary violence, the inflammation and other concomitant ſymptoms will not prove ſo formidable as they commonly do where the capſular ligament and other ſoft parts have been much ſtretched, or otherwiſe ſeverely injured.

One of the moſt unfavourable circumſtances with which a luxation is ever attended, is a fracture of one or both of the bones concerned in it. Even a fracture of the diſplaced bone is always a diſagreeable occurrence, and this eſpecially if it be broke near to its neck, as in this caſe it can ſcarcely be laid hold of for the purpoſe of reducing it; but the riſk attending it is much more conſiderable when the bone forming the ſocket into which it ſhould be received is alſo broke: for we know from experience, that fractures of theſe parts are more apt to be attended with ſevere de-

grees

grees of inflammation, as well as with extenſive ſuppurations, than fractures of any of the long bones. And when the ſocket is broke, there is always much hazard of the joint being rendered ſtiff for life, even when the reduction of the diſplaced bone is accompliſhed in the eaſieſt manner.

A diſlocation being more or leſs recent, is the next point requiring our attention: for we know that luxated bones are, cæteris paribus, more eaſily reduced ſoon after they are diſplaced than when much time has elapſed. While the injury is recent, the bone will neceſſarily paſs with more eaſe along the parts which it has juſt traverſed, than it poſſibly can do after lodging ſeveral weeks or months among the contiguous muſcles; where the head of it, inſtead of being looſe, as is uſually the caſe at firſt, will have formed a ſocket for itſelf, and will probably be firmly graſped by ſome of thoſe muſcular fibres which more immediately ſurround it. At this period too, the cavity

from whence it was diſlodged may probably be in ſome degree filled up by the contiguous ſoft parts: Not that the ſynovia ever becomes inſpiſſated, ſo as to produce this effect; for although this has by many been ſuppoſed to happen, and various means have been propoſed for preventing and removing it, yet we now know that the opinion is ill founded. No inſpiſſation of this fluid has ever been diſcovered by diſſection, although ſtiff joints, where this ſtate of the ſynovia was previouſly conſidered as the cauſe, have often been laid open for the purpoſe of detecting it. But although the cavity of a joint may not be filled up in conſequence of any particular affection of the ſynovia, there is much reaſon to ſuppoſe that in courſe of time it will be diminiſhed by the conſtant action of the contiguous muſcles; which will not only force the cellular ſubſtance, fat, and other ſoft parts with which it is covered, into it, but may even have ſome effect in compreſſing the bone itſelf,

ſelf, or the cartilaginous brim with which the bone is uſually covered.

Theſe are the circumſtances in diſlocations which more particularly require attention; but we have alſo to remark, that the patient's age and general ſtate of health influence the reduction of a diſlocated bone. Diſlocations are more eaſily reduced at ſome ages and in particular habits of body than in others. Thus, in advanced periods of life, and in weak delicate conſtitutions, where the muſcles give little reſiſtance, diſplaced bones are more eaſily moved than in the vigour of youth and in robuſt habits of body, where the ſuperior ſtrength of the muſcles has a conſiderable effect in preventing it.

In the treatment of diſlocations, the objects we have in view are, to put the bone that is diſplaced into its natural ſituation, with as much eaſe and expedition as the nature of the caſe will permit; to retain it in this ſituation till the injured parts have recovered their tone;

and to obviate pain, inflammation, and any other ſymptom that requires attention.

Before proceeding to the reduction of a diſlocation, we ſhould examine the contiguous ſoft parts, to ſee whether they be in a fit ſituation for it or not: for although the ſooner the operation is attempted, the more certain we will in general be of ſucceeding; yet whenever the ſurrounding teguments and muſcles are much contuſed and inflamed, it is better to allow the pain and ſwelling that takes place to ſubſide before any trial is made for reducing the bone; at leaſt I have always been in the practice of this. I never obſerved any bad conſequences enſue from it; and I have known much miſchief done by a limb being much ſtretched while the parts ſurrounding a diſlocated joint have been in an inflamed ſtate.

In ſuch circumſtances, therefore, we ſhould endeavour, by local blood-letting with leeches, by the uſe of ſaturnine applications,

plications, by a low regimen, and putting the limb in an eaſy relaxed poſture, to remove the inflammation before any attempt is made for reducing the bone.

In almoſt every diſlocation it is one bone only that is diſplaced, the other bone or bones of which the joint is formed remaining in their natural ſituation; and it will be found perhaps univerſally, that it is the bone connected with the inferior part of a limb that is forced from its ſituation, the bone forming the upper part of the joint, if it be not fractured, being ſeldom in any reſpect altered: In the reduction therefore of a luxation, the only attention we have to give to the upper part of a limb, is to keep it firm and ſteady, while we endeavour by the eaſieſt and moſt effectual means to replace the under part of it.

A perſon not acquainted with anatomy, might be led to ſuppoſe that this may always be readily accompliſhed; as he will be apt to conclude, that the ſame degree of force which puſhed a bone out

of its place, will with equal eaſe replace it. This would no doubt be the caſe were it the bone only that we had to act upon, or if it was merely connected with inorganic matter that would not give any reſiſtance to the means employed to reduce it: But every joint being either partly ſurrounded by, or much connected with, muſcles, the contractile power with which they are endowed acts with much force and advantage againſt every attempt that is made for the reduction of the bone; for they not only draw it beyond the end of the contiguous bone againſt which it ought to be placed, but they often pull it out of its natural direction, and fix it firmly in ſome neighbouring cavity, from whence it is diſlodged with difficulty; while the ſtimulus created by every trial we make for replacing the bone, is apt to excite a further exertion of the muſcles, and increaſes the difficulty which accompanies the reduction.

It is therefore obvious, that in the reduction of every diſlocated bone, the muſcles

cles with which it is connected ſhould be put as much as poſſible into a ſtate of relaxation; for in this ſituation, the reſiſtance they give to the force employed for moving the bone is inconſiderable, when compared with what is required for the ſame purpoſe when they are kept in a ſtate of extenſion. In the one, it is uſually done with eaſe, both to the patient and ſurgeon; while in the other, that is, while a limb is much ſtretched or extended, it is with the utmoſt difficulty that a diſlocated bone can be moved.

By relaxing all the muſcles of a limb, we may in general obtain as much force as is requiſite for reducing a luxation merely from aſſiſtants; but in ſome inſtances more is required than can be applied in this manner: In ſuch caſes, various inſtruments have been propoſed for increaſing our powers of extenſion: Some of which, and perhaps the moſt uſeful, are delineated in Plates LXXVII. and LXXVIII.

But whether we find it neceſſary to uſe machines of this kind or not, no more force ſhould be ever employed than is juſt requiſite; and it ought always to be applied in a ſlow gradual way, by which there is much leſs riſk of any harm being done, than when the muſcles of a limb are forcibly and ſuddenly ſtretched: And it will alſo be underſtood, that the whole force uſed for the reduction of a diſlocated one, ſhould be applied to that bone only, and not to any other part of the limb.

Beſides the reſiſtance ariſing from the action of the muſcles, we ſometimes meet with a good deal of difficulty from the projecting end of a diſlocated bone having paſſed that of the contiguous bone. In this caſe the extenſion is to be made in ſuch a direction as will beſt obviate this occurrence.

In extending a limb for the purpoſe of reducing a diſlocation, it is abſolutely neceſſary to carry the extenſion ſo far as to diſlodge the diſplaced bone, and to bring

bring the end of it on a line with the end of the other to which it is to be oppoſed, otherwiſe no advantage will be gained by the operation: for while any part of one bone projects paſt the extremity of the other, no means we can employ will be able to replace it, unleſs a ſufficient force be applied to it, as has ſometimes happened, for breaking off the projecting part; while, on the contrary, the reduction is always accompliſhed in the eaſieſt manner, as ſoon as the diſplaced bone is drawn freely paſt all the projecting parts of the other: nay, when the end of a diſplaced bone is brought to this ſituation, it would be difficult to prevent it from paſſing inſtantaneouſly into the ſituation where it is naturally lodged. So that in the reduction of diſlocations, our chief object is to make a ſufficient degree of extenſion in the eaſieſt manner, when the ordinary action of the muſcles will for the moſt part replace the bone: Or when this fails, the

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moſt gentle preſſure will be ſufficient for the purpoſe.

The diſlocated bone being reduced, there is ſeldom any difficulty in retaining it in its ſituation, unleſs it has often been diſplaced before: The ſureſt means of effecting it is by putting the limb into a relaxed poſture, and ſupporting the bone that has been juſt replaced with a proper bandage, till the ſurrounding ſoft parts have recovered their natural tone.

The ſymptoms that prove moſt urgent in diſlocations, both before and after the bones have been reduced, are, pain, inflammation, and ſwelling. For the moſt part they abate after the reduction is completed; but while any degree of inflammation continues, repeated applications of leeches ſhould be adviſed as the moſt effectual remedy: and as this ſymptom is to be conſidered as the cauſe of all the others, as well as of thoſe chronic pains which joints are liable to that have ever been diſlocated, it requires particular attention. But having conſidered this ſubject

ject very fully when treating of contuſions, we muſt refer to Chap. XXXVII. Section II. § 2. for what was then ſaid upon it.

In the firſt part of this ſection, we have ſaid that luxations are ſometimes combined with fractures of the diſplaced bones. When a bone is fractured at a conſiderable diſtance from the luxated joint, we may for the moſt part be able to reduce the luxation immediately, when the fracture ſhould be treated in the uſual way: But when a bone is fractured ſo near to the luxation that it cannot be laid hold of, the caſe is thereby rendered both difficult and uncertain. In the ſmaller joints, as in thoſe of the fingers and toes, the diſplaced portion of bone may in ſome inſtances be puſhed into its ſituation; but in all the larger joints, particularly in the hip-joint, and in that of the ſhoulder, we muſt firſt allow the fracture to heal, and the union of the fractured bones to be perfectly firm, before we attempt to reduce the luxation.

In compound luxations, that is, where joints are not only luxated but laid open by external injuries, the treatment we have adviſed in compound fractures will prove equally applicable. Indeed the nature of theſe affections is ſo ſimilar, that almoſt all the obſervations made upon the one will apply with nearly equal propriety to the other: ſo that at preſent we ſhall refer to Section XV. of the laſt Chapter, where the ſubject was particularly conſidered.

We may juſt ſhortly obſerve, that after the luxated bones are replaced, and the limb laid in a proper poſture, our next object is to prevent inflammation; which we do with moſt certainty by copious blood-letting with leeches applied as near as poſſible to the injured parts; dreſſing the ſores with Goulard's cerate, or any other mild ointment; moderating the pain with adequate doſes of opiates; and a low regimen.

This being done, we have to endeavour to prevent any matter from lodging a-

bout the joint, by placing the limb in ſuch a manner as will not readily allow it to run off: if this fails, by dreſſing the ſore more frequently, and abſorbing the matter with a bit of ſponge; or, when the quantity of matter is conſiderable, by a counter-opening made in a depending ſituation.

When mortification takes place, it is to be treated in the manner we have adviſed, when ſpeaking of this ſubject in a former publication*.

All that we have hitherto ſaid relates in general to luxations produced by external violence. When they proceed from the heads of bones being puſhed from their ſockets, either by tumors of a fleſhy or oſſeous nature, or by collections of matter, they may almoſt in every inſtance be conſidered as incurable: When the joint is ſo ſituated that the diſeaſed parts can all be removed, this meaſure ſhould be adviſed; but when this cannot be completely

* Treatiſe on the Theory and Management of Ulcers, &c. Part I. Section III.

pletely effected, all that art ſhould attempt is, to give as free a diſcharge as poſſible to any matter that may form, and to ſupport the conſtitution with a proper diet, to prevent it from being too much reduced by the diſcharge.

Diſlocations are ſometimes the conſequence of too great a relaxation of the ligaments and tendons which ſerve to connect the bones in a healthy ſtate. This relaxation is ſeldom ſo completely removed as to prevent the bones from falling out from time to time: but the inconveniency may be in ſome meaſure obviated by ſupporting the limb with a proper bandage; by endeavouring to reſtore the tone of the relaxed parts by cold bathing; and, in ſome inſtances, electricity has appeared to prove uſeful.

We ſhall now proceed to ſpeak of diſlocations from external violence as they occur in particular parts.

SECTION

SECTION II.

Of Luxations of the Bones of the Cranium.

THE bones of the cranium are frequently ſeparated from each other at the ſutures in caſes of hydrocephalus internus. This, however, can ſeldom become an object of ſurgery. If the collection is removed either by the uſe of medicines or by an operation, all that art can do farther is to ſupport the parts with a proper bandage.

We alſo find in ſome inſtances, that openings are produced at the ſutures by external violence, particularly by falls from great heights. Accidents of this kind, however, very commonly prove fatal. I have only met with one inſtance of a patient under ſuch circumſtances recovering.

covering. All that can with propriety be done, is to ſupport the parts by gentle regular preſſure with a proper bandage; to preſcribe blood-letting and other remedies, according to the violence of the ſymptoms; and to keep the patient quiet and confined to a proper poſture during the cure.

SECTION III.

Of Luxations of the Bones of the Noſe.

THE bones of the noſe are ſo firmly united, and they ſerve ſo effectually to ſupport each other, that they are ſeldom diſlocated. Inſtances of it, however, are ſometimes met with.

As theſe bones are only thinly covered with ſoft parts, luxations in any part of the noſe are eaſily diſcovered by

by the touch, as well as by the deformity which they occaſion.

In the reduction of a luxation of theſe bones, the patient ſhould be ſeated oppoſite to a proper light, with an aſſiſtant behind ſupporting his head; and the ſurgeon ſtanding before, ſhould endeavour to replace the bones with as much exactneſs as poſſible. In general this will be practicable with the fingers alone; but when one of the bones is puſhed inwards, it will be more eaſily accompliſhed by puſhing one of the tubes in Plate XLIII. fig. 2. up the correſponding noſtril, in order to elevate the depreſſed piece; and if the tube be guarded with ſome plies of ſoft lint, it may be retained in its ſituation till there is no longer any riſk of the bone ſlipping out.

When either of the bones of the noſe is puſhed outwards, it muſt firſt be exactly replaced, and afterwards retained in its ſituation by a proper application of a double-headed roller.

SECTION IV.

Of Luxations of the Lower Jaw.

THE lower jaw is connected by a piece of very beautiful mechaniſm with the bones of the head. There is in each temporal bone an irregular oblong cavity, immediately before the external meatus auditorius. In theſe cavities, the two condyles of the lower jaw are lodged; and by means of two intermediate looſe cartilages which move along with the condyles, and which correſpond with the irregular ſurfaces of the cavities in which they are placed, ſuch a degree of firmneſs is given to this joint as would otherwiſe be inconſiſtent with the freedom of motion of which it is poſſeſſed; for although the condyles of the jaw are ſecured

cured by different ligaments, as well as by ſtrong muſcles, to their ſituations, particularly by the ſtrong tendons of the temporal muſcles inſerted into the coronoid proceſſes of the jaw; yet the variety of motions which the under jaw is conſtantly performing, would render it very liable to diſlocations, were it not for the intervention of theſe moveable cartilages, which admit of every neceſſary freedom; while ſuch a looſe, extenſive motion is prevented, as muſt have happened if the heads of the condyles had been placed in large ſmooth cavities without theſe cartilages between them.

The under jaw cannot be diſlocated either upwards, backwards, or laterally; it can only be diſlocated forward and downward. In every other direction, the condyles are ſo much ſurrounded with bone, that they cannot be forced out of their correſponding cavities, as will be readily ſeen on an examination of the ſkeleton: But when the mouth is widely opened, as happens in yawning, the con-

dyles are apt to ſlip too far over the anterior boundaries of theſe cavities. In this manner a diſlocation takes place, as we diſcover by the chin being thrown forward and downward, while the mouth remains open, at the ſame time that much pain is produced by every attempt to cloſe it; nor can the patient ſpeak diſtinctly, or ſwallow but with much difficulty.

In ſome caſes one ſide only of the jaw is diſlocated, that is, one of the condyles remains nearly in its natural ſituation, while the other is thrown entirely out. In this caſe, the jaw, inſtead of falling directly down, is puſhed downwards and ſomewhat towards the ſide oppoſite to that in which it is diſlocated.

Beſides the ſymptoms we have mentioned of pain on any attempt to cloſe the mouth, and of difficulty in ſpeaking and ſwallowing, we are told by all the ancient writers on this ſubject, and by all thoſe who have copied from them, that luxations of the jaw are apt to induce convulſions, and even death. I have

have never, however, met with an inſtance of this, nor is it probable that it will ever happen, unleſs from great miſmanagement on the part of the ſurgeon.

A luxation of the jaw being very diſtreſſing, and even alarming to thoſe not acquainted with the real nature of it, immediate aſſiſtance is commonly deſired; and with due attention we can ſeldom fail in reducing it.

The patient being firmly ſeated on a low chair, with his head properly ſupported behind, the ſurgeon ſtanding before, with his thumbs ſufficiently guarded, ſhould puſh them as far as they will go between the teeth of the upper and under jaws, the under or flat part of the thumbs being applied to the teeth of the under jaw; the palm of each hand ſhould be applied to the outſide, while with his fingers he lays a firm hold of the angles of each jaw. With the fingers applied in this manner, he ſhould pull the under jaw forward till he finds it move ſomewhat from its ſituation: and

this being done, but not till then, he ſhould preſs the jaw forcibly down with his thumbs, and moderately backwards with the palms of his hands; when, if the different parts of the operation be rightly managed, the ends of the bone will immediately ſlip into their ſituation; upon which the thumbs ſhould be inſtantly withdrawn.

In general, we are directed to preſs the jaw downwards and backwards: but although this might ſucceed in ſome inſtances where the jaw is diſlocated only on one ſide, yet even there it would often fail; and it would ſeldom anſwer when both condyles are out: For till they be quite diſengaged from the bones on which they reſt, and which they can only be by pulling the jaw forward, all the force we can employ in pulling them down will be of little avail, as I have ſeen in different inſtances.

I have deſired, in preſſing down the jaw, that at the ſame time it ſhould be preſſed moderately backwards: The

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ſlighteſt force, however, in this direction will be ſufficient: nay, in ſome caſes it will not be found neceſſary; for as ſoon as the condyles are ſufficiently depreſſed, they are almoſt inſtantaneouſly drawn into their natural ſituations by the ordinary action of the temporal muſcles, whether any force be applied for this purpoſe or not.

The treatment we have adviſed anſwers equally well, whether the jaw be luxated on one ſide or on both; but where one condyle only is thrown out, the force uſed for depreſſing the jaw ſhould be chiefly applied to that ſide.

A luxated jaw being reduced, the patient ſhould be adviſed to avoid every cauſe that might have any effect in throwing the bone out again; particularly much ſpeaking, gaping, and yawning, as the condyles are apt for a conſiderable time to be turned out by any of theſe.

In the reduction of a diſlocated jaw, the thumbs are very apt to be bit if they

be not well protected, or if they be not inſtantly withdrawn on the bones ſlipping into their ſituations. For the moſt part the end of a handkerchief is wrapped round them; but a covering of firm leather anſwers better, or a caſe of thin iron covered with leather, would be ſtill preferable, as it would not occupy ſo much ſpace. It would paſs farther into the mouth, and would thus act with more advantage in forcing down the jaw.

SECTION V.

Of Luxations of the Head.

THE head is connected in ſuch a manner with the atlas or firſt vertebra of the neck, that it moves upon it with eaſe and freedom backwards and forewards,

wards, the two condyles of the os occipitis being received into correſponding cavities in the ſuperior oblique proceſſes of that bone: But the lateral and rotatory motion of the head proceeds from the immediate connection between the head and ſecond vertebra of the neck by means of the proceſſus dentatus of that bone; which paſſing through the back part of the large cavity of the atlas, is fixed by means of different ligaments to the os occipitis.

The connection between the head and the firſt of theſe bones is ſo firm that it is not probable they are ever ſeparated; at leaſt I have not heard of any inſtance of this being diſcovered on diſſection. It rather appears that in luxations of the head the connection is deſtroyed between the head and the ſecond vertebra, the head being forced with ſuch violence forward as to ſtretch or rupture the ligaments by which the tooth-like proceſs of this bone is fixed to the occiput: at leaſt this has been found to be the caſe in

in different inſtances of theſe diſloca-tions; and it has been commonly obſer-ved in people who have ſuffered by hang-ing.

In every diſlocation of the head, the head falls forward upon the breaſt; the patient is inſtantly deprived of ſenſibili-ty; he lies as if he were dead; and ſoon dies if the luxation be not quickly re-duced. Injuries of this kind are produ-ced moſt frequently by falls from great heights or from horſeback.

Luxations of the head for the moſt part terminate fatally; but as ſeveral inſtances have occurred where this has been prevented where timeous aſſiſtance has been given, we have reaſon to ſup-poſe that recoveries from this accident would be more frequent if this could be always procured.

Different means have been propoſed for the reduction of theſe luxations; but every thing requiring much preparation is here inadmiſſible. In all ſuch caſes, our views muſt be inſtantly carried into execution; and it fortunately happens, that

that in perhaps every inſtance they may be accompliſhed without any preparation.

The patient being ſeated upon the ground and ſupported by an aſſiſtant, the ſurgeon ſtanding behind ſhould raiſe the head from the breaſt; and the aſſiſtant being deſired to preſs down the ſhoulders, the head ſhould be gradually pulled ſtraight up till the diſlocation is reduced; or if this does not happen with moderate extenſion, it may at the ſame time be gently moved from ſide to ſide. A ſudden crack or noiſe is heard on the reduction being completed; and if the patient be not entirely dead, it is immediately aſcertained by a partial recovery of all his faculties. In ſome caſes they have been completely reſtored on the head being replaced; but in others they have remained long impaired, and in ſome have always continued ſo.

The reduction being effected, the patient ſhould be immediately laid in bed. His head ſhould be kept elevated, and retained

tained by a proper bandage for a conſiderable time in one poſture. And with a view to prevent inflammation, bloodletting ſhould be preſcribed in ſuch quantities as the patient can eaſily bear; his bowels ſhould be opened with proper laxatives; and he ſhould be confined to a low regimen.

SECTION VI.

Of Luxations of the Spine, Os Sacrum, and Os Coccyx.

THE vertebræ or bones of which the ſpine is compoſed, are ſo intimately connected by the proceſſes of one bone running into correſponding parts of another, as well as by ſtrong ligaments and muſcles, that they are very ſeldom diſlocated. They are ſo firmly united indeed,

deed, that I do not ſuppoſe that any of them can be diſlocated by external violence without being fractured. Beſides the means of connection we have mentioned, the vertebræ of the back are much ſtrengthened by the ſupport they receive from the ribs.

I never met with a complete diſlocation of any of the vertebræ; nor do I ſuppoſe that it ever happens, even when accompanied with a fracture, without producing immediate death: for the force neceſſary to move one of the vertebræ, from its ſituation, would not only be attended with the compreſſion, but even with the laceration, of the ſpinal marrow, while the contents of the thorax or abdomen would be eſſentially injured. I do not ſuppoſe, therefore, that a complete diſlocation of any of theſe bones can ever become an object of ſurgery.

We know, however, that one or more of the vertebræ may be partially diſlocated, and that the patient may ſurvive for a conſiderable time. In ſome caſes, perhaps, complete cures may be obtained;

ed; but I believe theſe will not be frequent.

Theſe luxations are uſually produced by falls from great heights, or by violent blows, or by the paſſing of heavy weights over the body.

They are diſtinguiſhed by the body being diſtorted, by examination with the fingers, and by the ſymptoms which they induce; which are ſuch as uſually occur from compreſſion of the ſpinal marrow; particularly a paralyſis of all that part of the body lying beneath the injured part, and either a total ſuppreſſion of urine or an involuntary paſſing of both urine and feces.

There is reaſon to ſuppoſe, from the mechaniſm of the parts, that the vertebræ will ſeldom or never be diſlocated outwards: They are uſually forced directly forward, or in ſome degree to the right or left ſide. On this account it is extremely difficult to accompliſh their reduction, as the contents of the thorax or abdomen muſt always lie between the injured

injured parts and the means uſed for this purpoſe.

Various means have been propoſed, and different machines invented, for the reduction of diſlocated vertebræ. Theſe machines, however, ſhould be laid aſide, as being not only uſeleſs but dangerous: for whoever has paid attention to the anatomy of the ſpine, will ſee, that in diſlocations of the vertebræ ſcarcely any advantage is to be gained from the application of much force, while a great deal of miſchief may evidently enſue from it.

When one or more of the vertebræ are luxated forward, of which we can only judge by an accurate examination with the fingers, the moſt certain method perhaps of reducing the diſplaced bones is, to bend the body ſlowly and gradually forward, as far as it can be done, over a caſk or any other cylindrical ſubſtance of a ſufficient ſize. If the bone by this poſition regains its ſituation, the body ſhould be immediately raiſed;

and the attempt ſhould be repeated when it does not ſucceed at firſt.

When the diſplaced bone is puſhed much out of its natural ſituation, neither this nor any other method will probably ſucceed; but it has certainly done ſo in different inſtances of partial diſlocations. In bending the body forward, the two vertebræ lying contiguous to the one that is puſhed forward are ſomewhat farther ſeparated from each other; by which the diſplaced bone may, either by the compreſſion produced upon the abdomen, or by the ordinary action of the contiguous muſcles, be forced into the ſituation it formerly occupied.

When the diſlocated bone, inſtead of being puſhed ſtraight forward, is forced in any degree to one ſide, the body, while the reduction of it is attempting, ſhould not only be bent forward, but ſomewhat towards the affected ſide; by which means the two contiguous vertebræ will be ſeparated to a greater diſtance than

they poſſibly could be by bending it either directly forward or towards the oppoſite ſide.

When any part of the os ſacrum is luxated, all we can do is to replace it with as much exactneſs as poſſible by external preſſure, and by bending the body forward in the manner we have mentioned.

The coccyx is more frequently luxated than any of theſe bones, as it is equally liable to the ſame kinds of injuries, beſides being more expoſed to the effects of falls, &c.

This bone may be luxated either outwardly or inwardly. It is apt to be forced outwards in laborious births, when much violence is uſed in pulling down the head of a child. And in ſome inſtances the ſame accident has occurred from large collections of hard feces in the rectum. We judge of this injury having occurred, from the pain which takes place all over the region of the loins, particularly about the junction of

the os coccyx with the ſacrum; and from the diſplaced bone being diſcovered upon examination with the fingers.

When the coccyx is luxated inwardly either by falls or blows, the patient complains of much pain, and a ſenſation of a tumor or ſome other hard body compreſſing the under part of the rectum; he is liable to teneſmus; he finds much difficulty in paſſing the feces; and in ſome inſtances a ſuppreſſion of urine takes place. On the finger being introduced at the anus, the diſplaced portion of bone is readily diſcovered.

In outward luxations of the coccyx, we ſeldom find much difficulty in replacing the bone by external preſſure with the fingers; but it is often difficult to retain it in its ſituation. It can only be done by ſupporting the parts with proper compreſſes and bandages. The T bandage anſwers for this purpoſe better than any other.

In the reduction of an internal diſlocation of this bone, the fore-finger of one

one hand, after being immerſed in oil, ſhould be paſſed as far as poſſible up the rectum. By means of it the bone ſhould be preſſed into its ſituation; while with the other hand we ſupport the parts which correſpond with it externally.

As diſlocations of theſe bones, particularly of the coccyx, are very apt to excite inflammation, and as this is apt to terminate in abſceſſes which do not readily heal, we ſhould omit nothing that may probably tend to prevent it. Blood-letting ſhould be preſcribed in proportion to the ſtrength of the patient, particularly local blood-letting by means of leeches, or cupping and ſcarifying; a lax ſtate of the bowels ſhould be preſerved; and the patient ſhould be confined to that poſture in which he is eaſieſt, and to a low regimen.

SECTION VII.

Of Luxations of the Clavicles.

THE clavicles are joined externally to the ſcapulæ at the acromion, and their interior ends are ſupported by the upper part of the ſternum.

As the clavicles are not poſſeſſed of much ſtrength, and being tied at their articulations to the contiguous bones by ligaments, they are more expoſed to fractures than to luxations. In ſome caſes, however, they are luxated. This may happen at either extremity of theſe bones, but it is more frequent at their junction with the ſternum than at the acromion: for the force by which luxations of the clavicles are produced is for the moſt part applied to the ſhoulders, by which their oppo-

oppoſite ends are moſt apt to be puſhed out.

As the clavicles are thinly covered, luxations of either of their extremities are eaſily diſcovered: They are commonly attended with a conſiderable degree of ſtiffneſs and immobility in the correſponding joint of the ſhoulder, for the neck of the ſcapula having loſt its ſupport, it is apt to be drawn out of its ſituation; by which the motion of every muſcle connected with the joint neceſſarily becomes affected.

A diſlocation of the clavicle is eaſily reduced by moderate preſſure with the fingers, eſpecially if the arms and ſhoulders be at the ſame time drawn back; by which the ſpace which the clavicle ſhould occupy may be ſomewhat lengthened. It is more difficult, however, to retain the bone in its ſituation, as it is apt to be again diſplaced on the preſſure being removed, by the ordinary action of the flexor muſcles of the arm.

We derive little advantage here from

ſupporting the arm. On the contrary, when the end of the clavicle connected with the ſternum is diſplaced, raiſing the arm does harm, as it tends to puſh the bone farther out of its place. It is, therefore, highly neceſſary to attend to this diſtinction in the management of fractures and luxations of this bone. In the latter, the raiſed poſture of the arm does miſchief: in the former, it is of ſervice, as we have ſhown in Chapter XXXIX. Section VII.

It is neceſſary, however, that the weight of the fore-arm ſhould be moderately ſupported, to prevent the ſhoulder from being too much drawn down. Beſides this, the head and ſhoulders ought to be ſupported, and a moderate preſſure made upon the diſplaced end of the bone. Various bandages have been propoſed for this, particularly the long roller applied in ſuch a manner as to form the figure of 8 upon the ſhoulders and upper part of the breaſt. No advantage, however, is gained from any bandage of this

this kind, as it cannot be retained ſo firmly in its ſituation as to produce any effect without impeding reſpiration. The machine repreſented in Plate LXXXIV. fig. 1. nearly the ſame as is commonly uſed for ſupporting the head, anſwers the purpoſe better than any other: for while it neceſſarily raiſes the head and keeps back the ſhoulders, the ſtraps which paſs over the upper part of the breaſt may be made to act with ſome force upon the diſlocated end of the bone. It is ſcarcely neceſſary to obſerve, that the uſe of this machine ſhould be continued for a conſiderable time, otherwiſe the bone will be apt to ſtart, when the whole will be to do over again.

SECTION VIII.

Of Luxations of the Ribs.

IT has been generally ſuppoſed that the ribs cannot be diſlocated; and accordingly this variety of luxation has paſſed unnoticed by different writers on this branch of ſurgery. It is only at the articulation of the ribs with the vertebræ that luxations can happen; and as they are connected with theſe bones by very ſtrong ligaments, it is uſually imagined that they will break before they yield at the joints.

It will readily appear, however, by an accurate examination of the junction of the ribs with the vertebræ, that they may be diſlocated inwards. They cannot indeed be puſhed either upwards, down-

downwards, or backwards; but we know from experience, that a ſtrong force applied near to their articulations will rupture their connecting ligaments, and thus puſh them forward. The fact has been proved by diſſection after death.

The ſymptoms induced by diſlocations will be nearly the ſame with thoſe which enſue from fractures of the ribs, viz. pain in the part affected, with difficult reſpiration; and if the end of the bone be puſhed into the ſubſtance of the lungs, emphyſematous ſwellings may enſue from it. A diſlocation, however, may be diſtinguiſhed from a fracture by the pain being moſt ſevere at the articulation, and by no part of the bone yielding to preſſure excepting at this very ſpot.

I believe it will commonly happen, that the end of a luxated rib, in conſequence of its elaſticity, will return to its natural ſituation when the cauſe which produced the luxation is removed; but when it does not, the beſt method of reducing it will be to bend the body forward

ward over a caſk or other cylindrical body, while the vertebræ immediately above and below the rib are preſſed inward with as much force as can with ſafety be applied to them. After this, a thick compreſs of linen ſhould be laid over the vertebræ we have mentioned, and another long one along the moſt prominent part of the diſlocated rib and the two immediately contiguous; when, by means of a long broad roller paſſed two or three times round the body, ſuch a degree of preſſure may be made upon the vertebræ as will retain them in their ſituation; while the preſſure made upon the projecting part of the rib tends to keep the end of it as ſteadily as poſſible in its ſituation till the ligaments that were ruptured be again united.

No bandage uſed for this purpoſe ſhould be applied with ſuch tightneſs as to give any impediment to the breathing. The beſt method of preventing the roller from moving is by the ſcapulary bandage paſſed over the ſhoulders, and

a

a ſtrap connected with it behind carried between the thighs and fixed to it before.

No diſlocation whatever is more apt to induce inflammation of the contiguous parts, and other diſagreeable ſymptoms. For the prevention and removal of theſe, nothing proves ſo effectual as copious blood-letting, preſerving the patient cool and at perfect reſt, a low diet, and opiates if a cough enſues and becomes troubleſome.

SECTION IX.

Of Diſlocations of the Humerus at the Joint of the Shoulder.

THE joint of the ſhoulder is formed by what is uſually termed a Ball and Socket, the round head of the os humeri

meri being lodged in a ſuperficial cavity on the anterior part of the ſcapula. This cavity is ſo ſuperficial, that in the ſkeleton it does not appear to contain above a tenth part of the head of the humerus; but in the recent ſubject it is much more conſiderable, by means of a cartilaginous brim, the capſular ligament, which ſurrounds the whole joint. By this mechaniſm, the ſhoulder enjoys more free motion than other joints: but it is at the ſame time expoſed to more frequent luxations; inſomuch, that there are more diſlocations of the ſhoulder than of all the other joints of the body.

The os humeri is moſt frequently luxated downwards directly into the axilla, owing to the head of the bone meeting with leſs reſiſtance in falling into this ſituation than in following any other direction. The head of the bone is ſometimes puſhed downwards and forward, and lodged beneath the pectoral muſcle, when we find it reſting on the

ribs between the coracoid proceſs of the ſcapula and the middle of the correſponding clavicle. In a few inſtances it is diſlocated downwards and backwards: but it can never be luxated upwards without being accompanied with a fracture of the acromion; of the coracoid proceſs; or perhaps of both.

The head of the bone, as we have already obſerved, for the moſt part takes that direction in which it meets with the leaſt reſiſtance; but this alſo depends in ſome degree on other cauſes, particularly on the part of the joint which received the injury, and on the ſituation of the humerus at the time. Thus, if a blow falls upon the upper part of the joint, while the arm is in a direct line with the body, any diſlocation that takes place will be downwards; while the head of the bone will moſt probably be forced downward and inward by any ſtroke given to the outſide of the joint while the elbow is ſtretched back, and vice verſa.

We

We judge that the humerus is diſplaced by the patient being unable to move the arm; by ſevere pain being excited on every attempt to preſs the arm near to the ſide; by the arm being of a different length from the other; from its being longer or ſhorter acccording as the head of the bone is lower or higher than its natural ſituation in the acetabulum ſcapulæ; by the head of the bone being felt either in the arm-pit beneath the pectoral muſcle, or backwards below the ridge of the ſcapula; and by a vacancy being diſcovered beneath the acromion. If the two ſhoulders be examined together, which ſhould always be done, the ſound one will be found round and prominent, while the fore-part of the other, if much tumefaction has not taken place, will appear to be flat or even ſomewhat hollow.

In luxations of long duration, the whole arm is apt to become œdematous, and to be in ſome degree deprived of ſenſibility, from the preſſure produced upon the

the nerves and lymphatic veſſels of the arm by the head of the bone. All the other appearances we have mentioned, are likewiſe ſo obviouſly induced by the diſplacement of the head of the humerus, that ſcarcely any of them require to be explained. The head of the bone being thrown out of its natural ſituation, muſt neceſſarily affect the action of every muſcle of the joint: Some will be too much relaxed, while others are too much ſtretched out: The motion of the joint muſt of courſe be conſiderably impaired. It is obvious too, that much pain muſt be excited by the arm being preſſed down to the ſide, as the head of the bone will not only be forcibly rubbed againſt ſome part of the ſcapula, but the ſoft parts on which it reſts muſt be greatly compreſſed, at the ſame time that ſome of the contiguous muſcles will be ſtretched to a degree which they cannot eaſily bear.

In a ſimple diſlocation of the humerus, our prognoſis ſhould in general be favourable; for in recent caſes we ſeldom fail in

in reducing the bone. It muſt be allowed, however, that inſtances ſometimes occur, in which the utmoſt difficulty is experienced in effecting a reduction; but this is ſeldom the caſe where the treatment has been properly conducted from the firſt. In diſlocations, indeed, of long continuance, the moſt expert practitioners often fail: for in ſuch caſes, the head of the bone has often formed a ſocket among the contiguous parts, from whence it cannot be diſlodged without tearing aſunder ſome of the muſcles with which it is ſurrounded; and when diſlodged, our endeavours may be rendered abortive by the cavity where the bone ſhould be lodged being too much diminiſhed for receiving it. In all caſes, therefore, of long duration, although it may be proper to make ſome attempts to replace the diſlocated bones, yet none that requires any great degree of force ſhould be much perſiſted in, for there is always ſome uncertainty of their ſucceeding, while they neceſſarily produce

a great deal of pain, at the ſame time that they are apt to render the motion of the head of the bone in the artificial ſocket, which it generally forms for itſelf, more ſtiff than it was before.

In general it is ſuppoſed, that the reduction is more eaſily effected when the head of the bone is in the axilla than when it is puſhed forward beneath the pectoral muſcle; and that in this ſituation it is more readily done than when it is lodged backward beneath the ſpine of the ſcapula. The latter I believe to be ſo; but I have not found in the treatment of the others that there is any difference between them.

In the reduction of a diſlocated humerus, we are in general told, that it is to be done by extenſion, counter extenſion, and the ſubſequent application of ſuch a force as is ſufficient to replace the bone. Theſe three indications, however, may all be comprehended in one. If a ſufficient degree of extenſion be applied for drawing the head of the bone on a line with the

acetabulum, the ſurgeon will ſeldom have any thing farther to do; for when brought to this ſituation, the reduction will almoſt in every inſtance be completed by the ordinary action of the muſcles.

All we have to do by counter extenſion, is to fix the body ſteadily while the arm is extending, and to prevent the ſcapula from being drawn forward by the force neceſſary for moving the arm; for if this bone be not fixed, it in ſome degree moves forward with the humerus, by which the force employed for extending the arm is much leſſened, at the ſame time that the cavity in the ſcapula in which the head of the bone is to be placed, is thus kept in a ſtate of motion, by which the reduction cannot be ſo readily effected.

This being done, our powers of extenſion are applied to the arm, till the head of the bone be drawn on a line with the brim of the ſocket; when, as we have obſerved above, it will inſtantaneouſly ſlip into its place by the action of the con-

contiguous muſcles; ſo that there is no neceſſity for the application of any force for this purpoſe. Much miſchief has often been done by force applied with this view, as we ſhall preſently ſee on conſidering the different modes of reducing luxations of this joint; for it is obvious, if the force uſed for raiſing the humerus be applied before the end of it be drawn paſt the moſt projecting point of the ſcapula, that the two bones muſt be thus preſſed together ſo as to obſtruct the reduction.

Various modes have been propoſed for the reduction of diſlocated ſhoulders, inſomuch that we ſeldom meet with two practitioners who do it in the ſame manner: But as one or other of theſe muſt be preferable to the reſt, and as it is of much importance to have this aſcertained, we ſhall offer a few obſervations upon each of them, and ſhall more particularly deſcribe the one which we think ſhould be adopted.

1. The humerus is often reduced by preſ-

ſure with the heel upon the head of the diſplaced bone. The patient being placed upon the floor, the ſurgeon alſo ſitting upon the floor, puts the heel of one foot, that of the left foot when he is operating upon the left ſhoulder, and vice verſa, upon the head of the bone, and laying hold of the fore-arm with both hands, he extends the arm, at the ſame time that he endeavours with his heel to puſh up the bone.

When the head of the bone has fallen directly downward into the arm-pit, we are directed by ſome to place a ſmall tennis ball or any other round ſubſtance between it and the heel; by which the preſſure may be continued with more certainty into the bottom of the axilla than where the heel alone is employed.

This method, however, is liable to three very important objections. By laying hold of the fore-arm, the joint of the elbow is conſiderably ſtretched, by which it may be much hurt, while a great part of the force is loſt upon it which ought

ought to have been applied entirely to the os humeri: By extending the fore-arm, ſeveral of the muſcles of the arm itſelf, as well as the biceps flexor cubiti, are put upon the ſtretch; by which the extenſion is made with much more difficulty than when theſe muſcles are relaxed by the joint of the elbow being properly bent. And, laſtly, whether the heel be employed by itſelf or with a ball, it is much more apt to do harm than good; for if it be not applied with ſuch nicety as to puſh the head of the bone directly towards the ſocket, it muſt neceſſarily force it againſt the neck of the ſcapula, or ſome others of the contiguous parts, and will thus tend in the moſt effectual manner to counteract the extenſion of the arm.

Beſides, in this manner, the arm muſt in every inſtance be pulled in a very oblique direction downwards by the relative ſituation of the ſurgeon and patient; whereas it ſhould in ſome caſes be raiſed

nearly, though not altogether, to a right angle with the body, and kept in that poſition while the extenſion is making.

It may be alleged, indeed, that this method often ſucceeds, and that it has long been employed by ſome of our oldeſt and moſt experienced practitioners. This I admit: but I alſo know that it often fails, even with thoſe who ſpeak moſt favourably of it; and that other modes of treatment have in various inſtances completed the reduction, where this had previouſly proved unſucceſsful.

2. Others attempt to reduce this diſlocation, by endeavouring to force the head of the bone into the ſocket with a rolling-pin applied beneath it, while a ſufficient force is employed for extending the arm, and for fixing the body in its ſituation. With a view to prevent the pin from hurting the ſkin, we are deſired to cover it with flannel, and that part of it which paſſes into the axilla is directed to be more thickly covered than the reſt.

But

But however this may in ſome inſtances have ſucceeded, it ought by no means to be received into practice. It is evidently liable to moſt of the objections we have mentioned to the mode of operating with the heel; particularly to the riſk of forcing the head of the humerus in beneath the neck of the ſcapula, and thus counteracting the force employed for extending the arm. It is obvious, too, even on the principle upon which it is recommended by thoſe who practiſe it, that this, as well as the mode of operating with the heel, cannot be applicable where the head of the bone is lodged either backward, or forward beneath the pectoral muſcle: for the ſole intention of both is to raiſe the head of the bone; and yet by ſome they are uſed indiſcriminately, whether the bone be luxated downwards, backwards, or forward.

3. The patient being properly placed, the body fixed by aſſiſtants, and the arm extended in the manner we ſhall afterwards

wards direct, ſome ſurgeons make uſe of a towel or girth for pulling the head of the bone into the ſocket. The ends of the girth being tied together, one end of the double is put over the arm and carried near to the head of the humerus; and the other being paſſed over the neck of the operator, he forces up the end of the bone by raiſing his neck: and if this could be done with ſufficient exactneſs, juſt when the head of the humerus has cleared the brim of the ſocket, no harm would ariſe from this part of the operation; but if the force for elevating the bone be applied before a ſufficient degree of extenſion is made for this purpoſe, it muſt evidently do miſchief by locking the head of the humerus and neck of the ſcapula together; ſo that this is in ſome meaſure liable to the ſame objections we have ſtated to the mode of operating with the heel and rolling-pin.

Theſe were the means uſually employed for reducing luxations of this joint; but

but being frequently found to fail, others have at different times been propoſed in order to increaſe the powers of extenſion.

4. Of this nature is the Ambe of Hippocrates, as it is termed: It is the one that was chiefly employed by ancient practitioners, and in ſome parts of Europe it is ſtill the only inſtrument uſed for this purpoſe: For this reaſon I have given a delineation of it in Plate LXXVI. fig. 1. but I do not by any means adviſe it to be employed. The powers of which it is poſſeſſed are great, but they cannot be properly applied; ſo that they are pernicious in proportion to their extent. It is liable in a tenfold degree to the objection we have ſtated above to the three preceding modes of reducing this bone, that of preſſing the head of it againſt the neck of the ſcapula; by which one or other of them muſt frequently be broke, as muſt readily occur to whoever examines this inſtrument with attention; for

for inſtead of extending the arm before raiſing the end of it, the firſt action of this inſtrument is to raiſe the extremity of the bone, by which it muſt frequently be ſo firmly puſhed in beneath the neck of the ſcapula, as to counteract with much effect the power that is afterwards applied for extending it.

5. The method of reducing this joint by means of a ladder has been long known, but we hope not often employed. The diſlocated arm being hung over the upper ſtep of the ladder, to which height the patient muſt be previouſly raiſed, and being ſecured in this ſituation by aſſiſtants, the ſeat on which he is placed is ſuddenly drawn away; by which the whole weight of the body falls upon the luxated joint, and by which we are told the bone may often be reduced when other means have failed. The top of a high door is ſometimes uſed for the ſame purpoſe. Whether the door or ladder be employed, that part upon which the arm

arm is made to reſt ſhould be well covered with ſeveral plies of ſoft cloth.

6. The patient being laid upon the floor, the bone has in ſome inſtances been reduced by two or three ſtout men ſtanding upon a table and lifting him up by the luxated arm.

7. Upon the ſame principle, it has been propoſed to raiſe the patient by the luxated arm with ropes running over pullies fixed in the ceiling of a high-roofed apartment. The jerk produced by the body being ſuddenly raiſed and let down, has in ſome caſes ſucceeded where other attempts to reduce the humerus had failed.

This was firſt practiſed, I believe, by the ingenious Mr White of Manchaſter; and I have known it ſucceed in different caſes of old luxations: But theſe methods are all liable to great objections. The force is too ſuddenly applied; by which more miſchief may be done to the ſurrounding ſoft parts than can be compenſated by the reduction of the bone.

bone. We know that muſcles, blood-veſſels, and ligaments, will ſtretch to a conſiderable degree, if the extending force be applied in a ſlow gradual manner: but we alſo know, that they very readily break when powerfully and ſuddenly ſtretched. Of this we have a remarkable inſtance in the burſting of the capſular ligaments of joints, which I believe to happen, as has been already remarked, in almoſt every caſe of luxation from external violence. This leads us to ſay, that any force that is uſed for the reduction of luxations ſhould be applied in the moſt gradual manner, and that the mode of operating we are now conſidering muſt frequently do miſchief by tearing and lacerating the ſoft parts ſurrounding the joint. Of this I have had various inſtances even where the teguments have been protected in the moſt cautious manner, by covering them with ſoft flannel, and afterwards with firm leather, before applying the ropes for extending the arm.

Beſides,

Beſides, in theſe modes of reduction, the arm muſt be always extended in the ſame direction, whether the bone be luxated forward, downward, or backward: Whereas the direction in which the arm is extended ſhould vary according to theſe circumſtances; as muſt be obvious to whoever attends to the anatomy of the parts concerned in the luxation. Nay, in one variety of luxation, irreparable miſchief may be done to the joint by extending the arm in a direction which, in another variety of the injury, might not only be proper but neceſſary. Where the head of the humerus is puſhed forward beneath the pectoral muſcle, or directly backward, we may readily ſuppoſe that it may be eaſily reduced by pulling the arm upward, as is done when the body is ſuſpended by a pulley in the manner we have mentioned; while much harm may be done by it where the head of the bone is lodged in the axilla, and puſhed beneath the neck of the ſcapula. In this caſe, the

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end of the humerus is often ſo firmly wedged between the ſcapula and ribs, that one or other of theſe bones would neceſſarily break by the ſudden application of much force in this direction; and it can only be prevented by extending the arm ſomewhat obliquely downward till the head of the humerus be quite diſengaged.

8. A machine has been invented for conjoining the power of the ambe with the mode of operating we have juſt been conſidering; in which the patient's body is nearly ſuſpended by the diſlocated arm, and is ſuddenly raiſed and let down again while the operator endeavours with the lever of the ambe to elevate the head of the bone. The invention is ingenious, and the inſtrument is evidently powerful; but if our objections to theſe two modes of operating, taken ſeparately, are well founded, they are no leſs ſo when they are combined. The powerful action of the lever muſt be hazardous in proportion to the uncertainty of its application. While the body is quickly riſing

riſing and falling, the lever cannot poſſibly be applied with exactneſs to the end of the bone; and if it be made to act with much force before the head of the humerus is cleared of the ſcapula, one or other of theſe muſt neceſſarily be fractured.

9. When the more ſimple methods of reducing luxations have failed, ropes and pullies have ſometimes been employed for diſlodging the diſplaced bones. Of theſe different forms may be ſeen in Plate LXXVII. fig. 2. in Scultetus, Plate XXII. fig. 1. and in Plate X. fig. 7. of Deſagulier's Experimental Philoſophy. By means of one or other of theſe, any degree of force may be applied that can ever be required for this purpoſe.

10. But when recent caſes are properly managed, luxations may in almoſt every inſtance be reduced without any aſſiſtance from machinery. I have often ſucceeded by the moderate extenſion I was able to make of the arm with one hand,

hand, while the other was employed in preſſing back the ſcapula. This, however, requires all the muſcles of the arm and fore-arm to be as much relaxed as poſſible; which we accompliſh by bending the elbow moderately, raiſing the arm to a height ſomewhat leſs than a right angle with the body, and preſerving it in ſuch a direction as to prevent either the pectoral or extenſor muſcles of the arm from being ſtretched. When the arm is in this ſituation, we often find luxations eaſily reduced which had previouſly reſiſted the greateſt force: for in this manner we not only relax the muſcles of the arm, but the capſular ligament of the joint; by which the head of the bone returns more readily by the opening at which it was forced out than it otherwiſe poſſibly could do. For when the ligament is much ſtretched, the neck of the bone will be firmly graſped by it, by which our being able to return it will neceſſarily be rendered more uncertain.

More force, however, is ſometimes required than can be applied in this manner; and the following is the method by which I have in every inſtance of recent luxations ſucceeded. The patient is ſeated upon a chair, and his body ſecured by a long broad belt paſſed round it, and given to aſſiſtants or tied round a poſt: a firm band of leather, four or five inches broad, and lined with flannel, as is repreſented in Plate LXXVII. fig. 3. is now to be tied round the arm immediately above the elbow. The three ſtraps or cords connected with this band being given to aſſiſtants, they muſt be deſired to extend the arm in the relaxed poſition we have mentioned, and in a ſlow equal manner, while another aſſiſtant ſtanding behind is employed in preſſing the ſcapula backward. The ſurgeon himſelf ſtands moſt conveniently on the outſide of the arm: His buſineſs is to direct the aſſiſtants in the degree of force they are to employ, and to point out the direction in which the arm is to be extended;

he may alſo ſupport the fore-arm and retain it bent at the elbow, in the manner we have mentioned. As ſoon as the head of the bone is drawn clearly paſt the brim of the ſocket, the extenſion of the arm ſhould be ſomewhat relaxed, when the reduction will for the moſt part be accompliſhed by the action of the muſcles of the joint; or it will be readily effected by moving the arm gently in different directions. A crack is heard on the bone ſlipping in; the patient finds immediate relief; and the anterior part of the ſhoulder acquires its uſual prominent form.

The direction in which the arm is extended muſt depend upon the ſituation of the head of the bone; that in which it will meet with the leaſt reſiſtance is always to be preferred. When the head of the bone is puſhed forward, and lodged beneath the pectoral muſcle, the arm ſhould be raiſed to a right angle with the body, and the ſame direction will anſwer where it is puſhed backward: But

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in the moſt frequent kind of luxation of this joint, where the head of the bone is lodged in the arm-pit, the arm ſhould uniformly be drawn ſomewhat obliquely downward: If extended when raiſed to a right angle with the body, it would be drawn againſt the neck of the ſcapula, by which much pain would be excited and the reduction fruſtrated. Of this I have ſeen many inſtances, as every practitioner muſt have done.

It ſhould be a general rule in the treatment of every luxation to vary the direction in which the extenſion is made as ſoon as we meet with any conſiderable reſiſtance; but in luxations of the humerus, attention to the obſervations we have juſt thrown out will for the moſt part prove ſufficient.

In reducing luxations of this joint, it has been the prevailing practice to preſs the ſcapula forward and downward: Nearly the reverſe of this, however, ſhould be adopted. By preſſing the ſcapula downward we force it againſt the

of the humerus, the very thing we ought moſt carefully to avoid: and by forcing it forward, it is evident that the end of the humerus will not be ſo eaſily drawn out from beneath it as when the aſſiſtant is deſired to pull it backward in the manner we have mentioned.

11. The mode of treatment I have juſt been deſcribing will ſucceed in almoſt every inſtance of recent luxation; and it will ſeldom fail even in caſes of long ſtanding, where reduction of the diſlocated bone is practicable: But when a greater force is required than can be applied in this manner, the inſtrument repreſented in Plate LXXVIII. may be employed. It was invented by the late Mr Freke of London; and it anſwers the purpoſe of extenſion better, and with more exactneſs, than any other I have ſeen. It is delineated exactly from the plate given of it by Mr Freke; but it admits of ſome improvements. The ſtrap A A which paſſes over the ſhoulder preſſes down the ſcapula, and thus impedes

PLATE. LXXVIII.

FIG. 1.

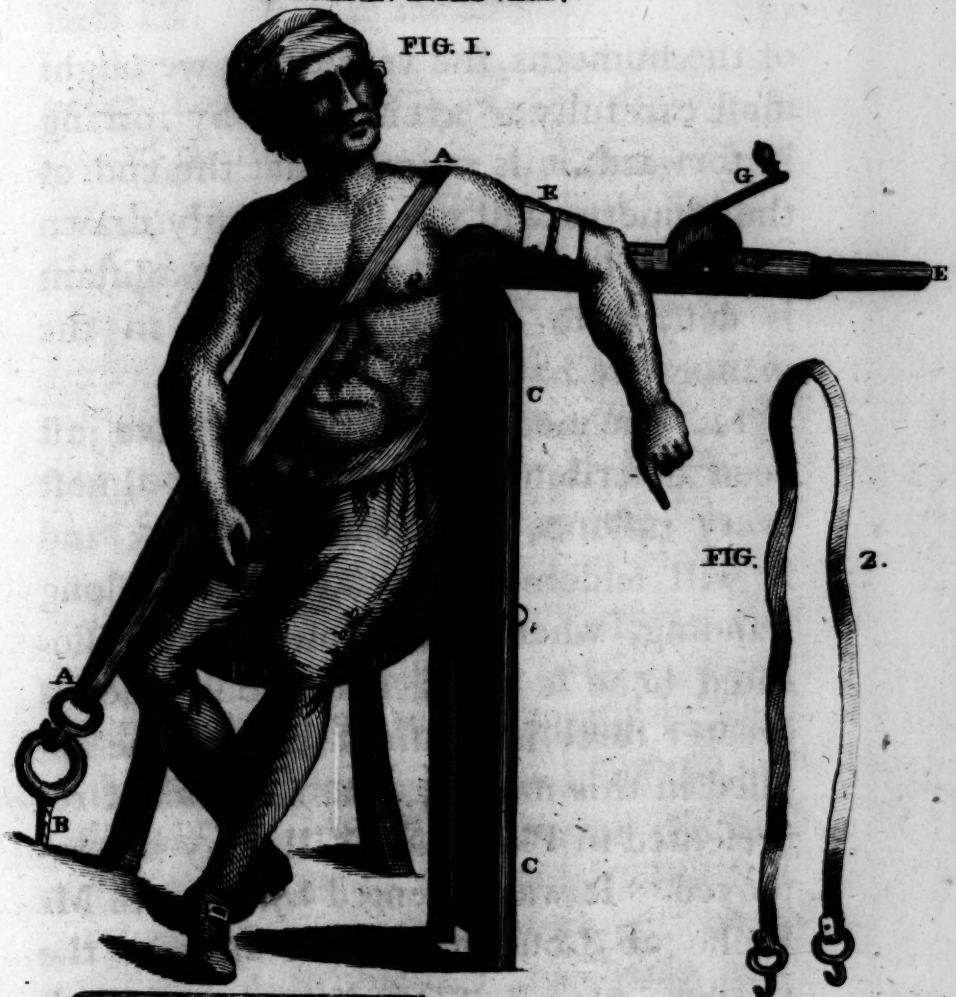


FIG. 2.

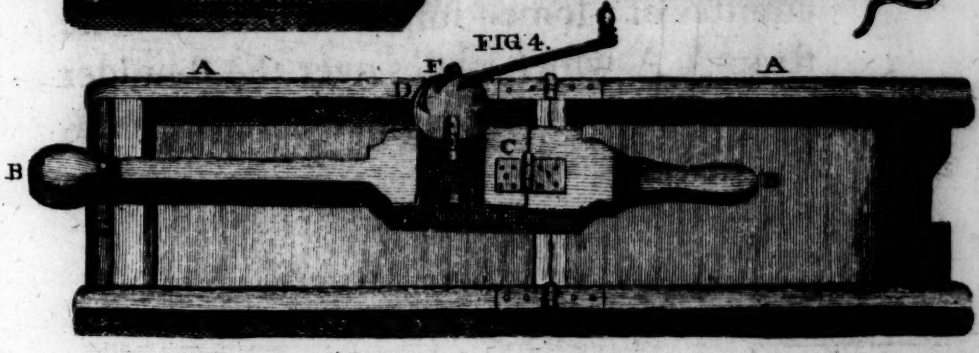
FIG. 3.

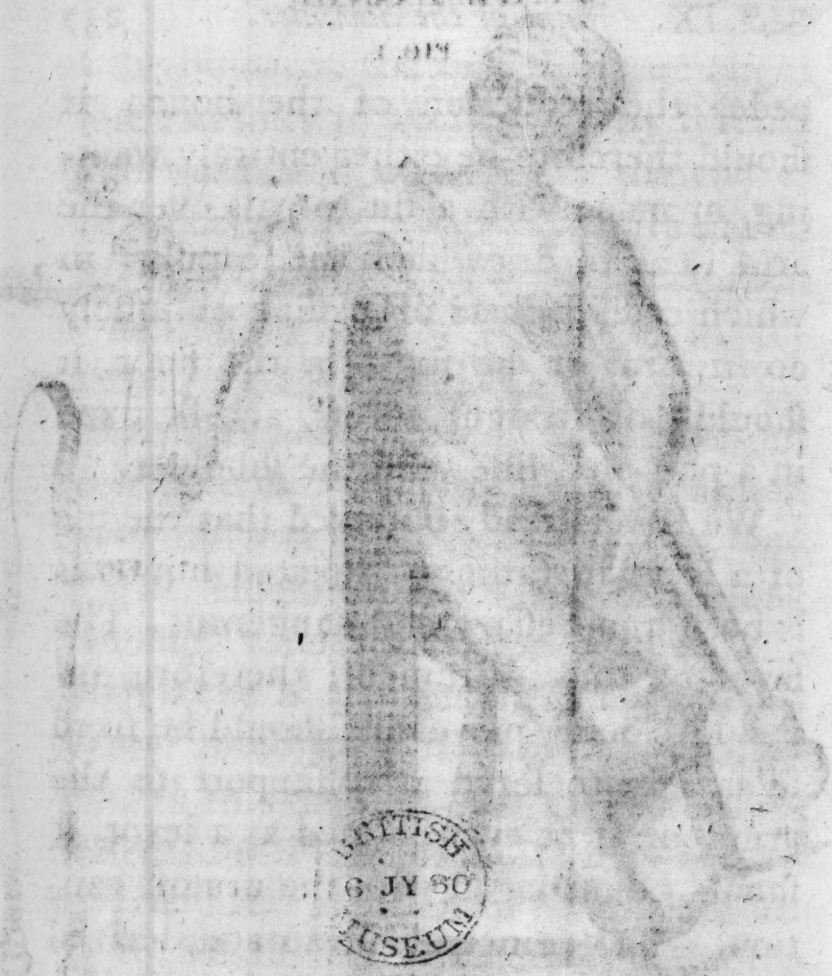


FIG. 5.



FIG. 4.




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pedes the reduction of the bone: It ſhould therefore be either entirely wanting, or made with a ſlit to paſs over the arm ſo as to draw back the ſcapula: in which caſe, inſtead of paſſing obliquely downwards to be fixed in the floor, it ſhould paſs ſtraight acroſs, and be fixed in a poſt on a line with the ſhoulder.

We have already obſerved that the uſe of a lever in raiſing a luxated humerus is both unneceſſary and dangerous: The lever of this inſtrument, therefore, inſtead of being moveable, ſhould be fixed ſo as only to ſerve as a ſupport to the arm; or if it ever be uſed as a lever, it ſhould be managed with the utmoſt caution. The principal advantage derived from this inſtrument is our being able, by means of it, to apply any force that may be neceſſary in the moſt gradual manner; an object of the firſt importance in the reduction of luxations: It alſo extends the arm in any direction we may judge proper; by which it can at once

be adapted to any variety of ſuch injuries.

Swelling, pain, and inflammation, when they occur as conſequences of luxations of the arm, are to be removed by the remedies uſually employed in ſuch caſes, but chiefly by local blood-letting by means of leeches.

The round head of the biceps flexor cubiti, which paſſes through the joint of the ſhoulder and is lodged in a groove in the head of the humerus, is apt to be ſeparated from this bone when it is forced far out of its natural ſituation, and thus induces a ſtiff unwieldy ſtate of the arm: for the moſt part it returns immediately to this groove on the diſlocation being reduced; and we ſuſpect that it continues to be diſplaced when any unuſual pain, ſtiffneſs, or tenſion remain. The moſt certain method of replacing it is to move the arm from time to time in every variety of way; and we know that it is replaced, by an inſtantaneous removal of the diſtreſs.

The glenoid cavity of the ſcapula being

ing very ſuperficial, the head of the humerus is apt to fall out again, even after it has been completely replaced; particularly when it has been frequently luxated. The moſt certain method of preventing this is to ſupport the arm in a ſling, as is repreſented in Plate LXXXI. fig. 2. till the parts recover their tone. Bliſters applied to the ſhoulder, and pumping cold water over the joint, have alſo proved uſeful for this purpoſe.

SECTION X.

Of Luxations of the Fore-arm at the Joint of the Elbow.

THE bones of the fore-arm at the elbow are more frequently diſlocated upward and backward than in any other direction: They can ſcarcely be luxated laterally or forward, if the injury be not

at the ſame time accompanied with a fracture of the olecranon or top of the ulna, as will be readily perceived on examining the connection of that proceſs with the cavity in the poſterior part of the os humeri.

As the joint of the elbow is not deeply covered with ſoft parts, any luxation of the bones is eaſily diſcovered as long as ſwelling and tenſion have not taken place. When theſe ſymptoms occur to any extent, it is often difficult to diſtinguiſh either the nature or extent of the injury with which they are connected. When the luxation is backward, the olecranon is felt on the back part of the arm, and the condyles of the humerus are puſhed forward. When the olecranon is broke and the ulna and radius puſhed forward, they are alſo apt to be drawn upward on the anterior part of the humerus, when the condyles of that bone are diſcovered behind. The extent of the joint is ſo conſiderable from one ſide to the other, that the bones com-

compoſing it can never be completely luxated laterally, unleſs the ſoft parts with which they are covered are much lacerated. In whatever way they are diſplaced, the joint becomes immediately ſtiff and immoveable.

In the reduction of theſe diſlocations the patient ſhould be ſeated on a chair of a convenient height, and the arm firmly ſecured by an aſſiſtant: where the bones are luxated backward, the fore-arm ſhould be moderately bent, in order to relax the flexor muſcles: while in this poſition it ſhould be ſlowly and gradually extended; and if care be taken to increaſe the curvature of the elbow in proportion as the extenſion is made, we will ſeldom or never fail in completing the reduction. Where the olecranon is broke, and the ends of the radius and ulna puſhed forward and drawn up upon the humerus, we are under the neceſſity of extending the arm while in a ſtraight poſition, as in this caſe the heads of theſe bones are puſhed back

back upon the anterior part of the humerus on the leaſt attempt to bend them. The extenſion ſhould be continued till the ends of both bones are pulled ſomewhat lower than the moſt depending point of the humerus, when they will either regain their ſituation by the action of the muſcles or be eaſily forced into it.

In lateral diſlocations of theſe bones the extenſion muſt alſo be continued till they have clearly paſſed the end of the humerus, when by moderate lateral preſſure they will for the moſt part be eaſily replaced. Of whatever kind the diſlocation may be, the extenſion ſhould be made by aſſiſtants graſping the arm immediately above the wriſt; and while they are thus employed, much advantage may be gained by the ſurgeon preſſing down the heads of the bones.

In two caſes of diſlocation of theſe bones, where their heads were drawn up upon the back of the humerus, the reduction was not accompliſhed, although

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a great force was applied, not only in pulling at the under part of the arm, but in puſhing down the heads of the diſplaced bones. In one of them, where the olecranon was puſhed through the teguments, that part of the bone was ſawn off, by which the reduction was effected: In the other, this expedient was not adviſed; and the practitioner finding all his efforts to reduce the bones prove abortive, the limb was amputated. As the extenſion in both was applied while the arm was ſtretched out, and as I have never failed in ſimilar caſes where the arm was bent, I conclude, that in the one the arm would have been ſaved, and in the other the joint preſerved entire, if this practice had been adopted.

The reduction being completed, the fore-arm ſhould be kept in that poſition which tends moſt effectually to relax all the muſcles connected with it. The elbow being moderately bent, anſwers this purpoſe in the moſt certain manner.

Theſe bones, when reduced, do not

readily fall out again; but it is proper in this, as in every caſe of luxation, to preſerve the limb as much at reſt as poſſible till the injured parts have recovered their tone.

The bones of the fore-arm are alſo liable to be diſlocated in their connection with each other. At the joint of the elbow a projecting part of the radius is lodged, and moves in a correſponding cavity of the ulna; and below, a portion of the ulna is received by a ſimilar cavity in the radius. Inſtances have occurred of theſe bones being ſeparated from each other at both theſe points of connection; but any ſeparation of this kind is more apt to happen at the wriſt than at the elbow. It is known to have occurred, by all the uſual ſigns of luxations: By pain, ſwelling, and diſtortion in the injured part; by the motion of the joint being impaired; and by manual examination.

In general the diſplaced bone is eaſily put into its ſituation; but for the moſt part

part we find it difficult to retain it. The moſt certain method of effecting this is, to put a long firm ſplint along the outſide of the arm from the elbow down to the points of the fingers, and another of the ſame length on the inſide; the whole to be ſecured with a flannel roller, and the arm hung in the ſling repreſented in Plate LXXXI. fig. 2. By this the rotatory motion performed by the radius, and the pronation and ſupination of the hand, is prevented; and if this is guarded againſt for a ſufficient length of time, a cure may at laſt be expected: While want of attention to this point is frequently the cauſe of the joint at the wriſt remaining ſtiff for life, of which I have met with various inſtances.

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SECTION XI.

Of Luxations of the Bones of the Wriſt.

THE bones of the wriſt are not ſo frequently luxated as might be expected from the ſmallneſs of their ſize, owing to their being firmly connected by ligaments, as well as to the ſtrength which they derive from the whole tending to form a kind of arch; the convex part of which being on the outer or back part of the hand, where it is moſt expoſed to injuries, is particularly well calculated for preventing any of the bones from being diſplaced.

Degrees of force, however, are ſometimes applied to them which they are unable to reſiſt. From their form, it will appear that they will moſt readily be diſlocated outward. The three ſuperior carpal bones that form a kind of pro-

projecting head, that is lodged in a ſuperficial cavity in the under extremities of the ulna and radius, may either be diſlocated at this joint, or they may be ſeparated from the five inferior bones of the wriſt. In ſome inſtances one or more of theſe bones are ſeparated from each other; and in others they are diſlocated at their connection with the bones of the metacarpus and the ſuperior bone of the thumb.

As theſe bones are not thickly covered with ſoft parts, the nature of the injury becomes immediately obvious when they are completely luxated: But in ſome caſes, where perhaps a ſingle bone is only partially diſplaced, if the parts be not examined with attention, the ſymptoms which occur are apt to be attributed to a ſprain; and the real cauſe of them being overlooked, a permanent lameneſs is thus induced, which with much eaſe might have been prevented. Of this I have met with various inſtances. Similar occurrences, however, may always be

be prevented by an early and attentive examination of the injured parts.

In reducing luxations of theſe bones, we are in general deſired to ſtretch the arm and hand upon a table, and while they are in this poſition to puſh them into their ſituations: But it is better to have the arm and hand ſupported by two aſſiſtants, as in this ſituation the ſurgeon gets ready acceſs to each ſide of the wriſt. The aſſiſtants ſhould be deſired to keep the parts ſufficiently firm, but not to ſtretch them; and when in this ſituation, the ſurgeon will ſeldom find it difficult to puſh the bones into their places. They muſt be retained by ſplints and bandages in the manner mentioned in the laſt ſection; and as diſlocations of theſe bones are very apt to induce inflammation of the ligaments and other contiguous ſoft parts, repeated applications of leeches ſhould be adviſed as the moſt certain preventative.

PLATE LXXIX.

FIG. 1.

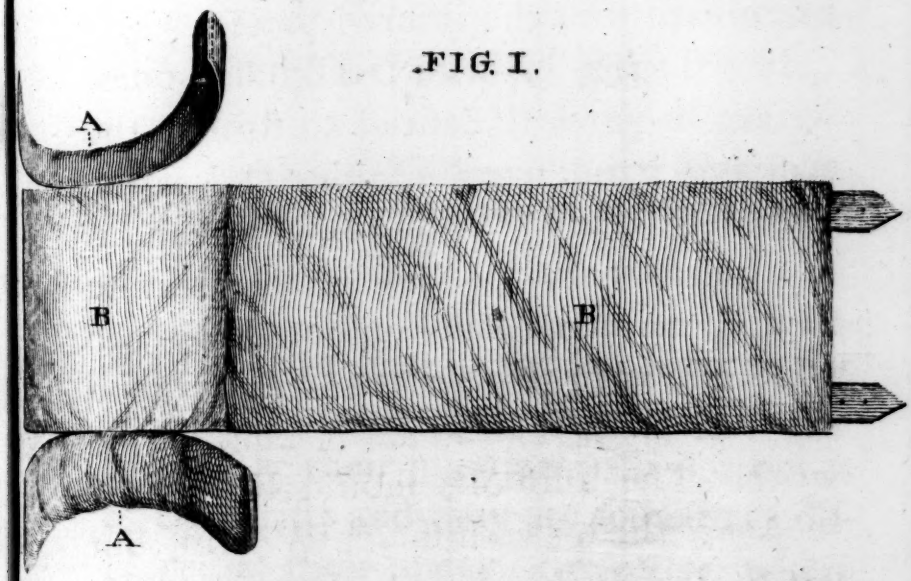


FIG. 2.

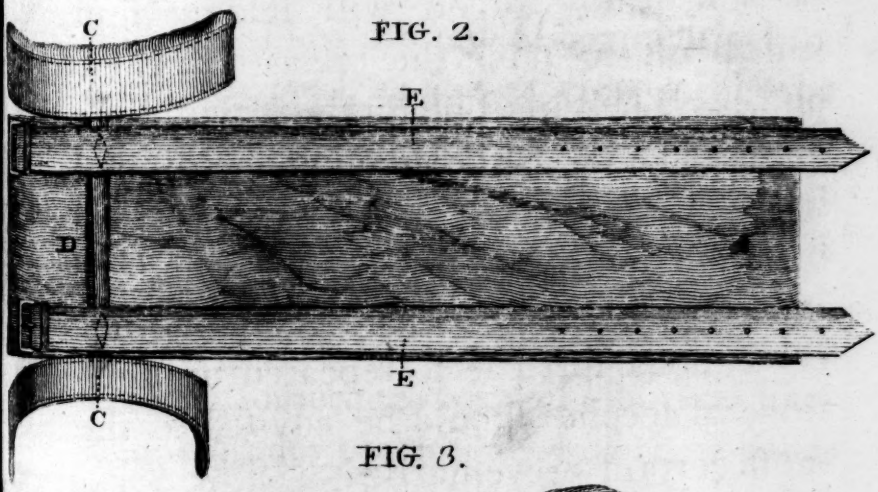
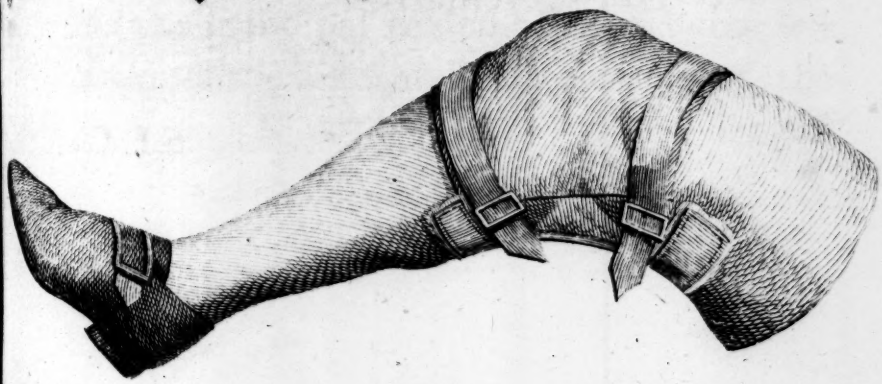


FIG. 3.



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SECTION XII.

Of Luxations of the Bones of the Metacarpus and Fingers.

WE have ſeen in the laſt ſection that the metacarpal bones may be diſlocated at their junction with the bones of the wriſt; and they are ſometimes diſplaced at their under extremities, where they are connected with the bones of the fingers. They are not ſo frequently luxated, however, as at firſt view might be expected; probably from the joint of the wriſt being ſo moveable, that the whole hand readily yields to any force that is applied to it.

The bones of the fingers and thumb are alſo ſometimes luxated; but we likewiſe conſider the mobility of theſe bones as the principal reaſon of their being leſs frequently diſlocated than many of the

largeſt and ſtrongeſt bones that are much more firmly connected together.

Diſlocations of theſe bones are eaſily diſcovered by the uſual ſymptoms which take place in luxations; but particularly by the deformity which they produce, which in this ſituation is always conſpicuous.

When any of the metacarpal bones are diſplaced at their connection with the bones of the wriſt, the beſt method of reducing them is, by keeping the arm ſteadily fixed, and puſhing them from above downward, while the hand remains looſe and moveable. When the firſt phalanx of any of the fingers is moved from its junction with the correſponding metacarpal bone, it is to be replaced by one aſſiſtant fixing the hand, while another draws down the diſlocated finger, which ſhould be done by graſping the firſt phalanx only, in order to prevent the other joints of the finger from being hurt. Diſlocations of all the other joints of the

fingers, as well as of the thumbs, are to be managed in the ſame manner.

In the reduction of theſe diſlocations, the bone ſhould not be pulled down till it be ſomewhat raiſed or elevated from the contiguous bone; for as all the bones of the fingers and thumbs, as well as thoſe of the metacarpus, are conſiderably thicker at their extremities than in any other part, theſe projections are apt to be forced againſt each other when the extenſion is made in a ſtraight direction. In this manner the greateſt force has frequently been employed in vain; nay, fingers have been amputated where this cauſe alone prevented luxations from being reduced, and in which a very inconſiderable force would have proved ſucceſsful, if the diſplaced bone had been ſomewhat ſeparated from the other before any force was applied for extending it.

SECTION XIII.

Of Luxations of the Femur at the Hip-Joint.

THE ſocket or acetabulum formed by the oſſa innominata for lodging the head of the thigh-bone is ſo deep; the brim of the ſocket in a recent ſubject contracts ſo much as even to graſp the neck of this bone; the head of the bone is ſo firmly tied down to the bottom of the ſocket by a ſtrong ligament; and it is ſo confined by ſtrong muſcles, that we would not *à priori* ſuppoſe that it could be luxated by external violence: We would rather imagine that it would break at the neck where it is weakeſt, than that the head of it ſhould ever be forced from its ſocket: This opinion has accordingly been adopted by many in all ages. For a conſiderable time I was diſpoſed to favour it, from having obſerved

ſeveral

ſeveral caſes which at firſt were ſuppoſed to be luxations, but which proved to be fractures of the neck of the femur. In the courſe of the laſt few years, however, I have ſeen ſeveral caſes in which I was convinced that the thigh-bone was luxated. The nature of the ſymptoms gave reaſon to imagine that they aroſe from luxations; and they were proved to do ſo by the patients being inſtantaneouſly and completely relieved on the head of the bone being replaced.

In treating of fractures of the thigh-bone, we mentioned the circumſtances by which fractures of the neck of it may moſt readily be diſtinguiſhed from luxations: We muſt therefore refer for this part of our ſubject to the eleventh Section of the preceding Chapter.

It is ſaid by authors, that the head of the femur may be luxated in various directions, namely, upward and backward, upward and forward, downward and backward, downward and forward, and I may add directly downward. That all

of theſe may happen, I cannot take upon me to deny; but I believe few practitioners have met with an inſtance of the firſt and third. The ſecond variety, where the head of the bone paſſes up upon the os pubis, may happen; as may likewiſe the laſt, where it is forced directly down: but I have never ſeen any variety except that in which the head of the femur is puſhed downward and forward, and lodged in the foramen ovale. All practitioners admit, that the bone is moſt frequently diſlocated in this direction; and an examination of the ſkeleton, as well as of the recent ſubject, will ſhow why it ſhould be ſo. The brim of the ſocket over all the upper and back part of it, is not only ſtronger, but more elevated than in the reſt of it. It falls away as it deſcends; and on the anterior under part of it there is a conſiderable vacancy in the bone, the ſpace being filled with a ligament only: and as this opening is ſufficiently large to admit the head of

the

the femur, we are led to imagine that luxations will be moſt apt to occur here.

Every luxation of the femur muſt be productive of lameneſs, and of pain, tenſion, and other ſymptoms with which luxations in general are accompanied. When the head of the bone paſſes upward and backward, the leg will be conſiderably ſhorter than the other; inſomuch that the points of the toes will only touch the ground when the patient is ſtanding upon the other foot; the great trochanter of the thigh-bone will be much higher than in the other ſide; the knee and foot will be turned inward; and a good deal of pain will be induced by every attempt to turn them out.

When the femur is luxated upward and forward, the leg will be ſhortened; the head of the bone will be felt reſting upon the os pubis in the groin; the great trochanter will be on the upper and anterior part of the thigh near the groin, while a vacancy will be diſcovered in that part of the hip which it ought to

occupy; the knee and toes will be turned outwards; and if the diſlocation be not ſoon reduced, pain, tenſion, and inflammation, will probably occur in the ſpermatic cord and teſtis from the preſſure made upon the cord by the head of the bone.

If ever this bone be luxated downward and backward, the leg will be conſiderably longer than the other; the knee and toes will be turned inward; and the great trochanter will be much lower than the ſame protuberance of the other limb. When the head of the bone paſſes directly downward, the leg will alſo be longer than the other, and the trochanter will likewiſe be lower; but the knee and toes will retain nearly their natural ſituation, only every attempt to move them will be productive of pain.

In the moſt frequent luxation of the femur, the leg appears to be conſiderably longer than the other; the knee and points of the toes are turned outward, nor can they be moved either farther

outward

outward or inward but with much pain; all the muſcles in the internal part of the thigh are tenſe and painful; the femur cannot be felt on the outſide farther up than the middle of the thigh; a vacancy is diſcovered in the uſual ſeat of the great trochanter, which is found farther down and on the anterior part of the thigh, while the head of the femur is plainly felt a little below the groin, being ſeated, as we have obſerved above, in the foramen ovale.

In all luxations of the femur, the difficulty and uncertainty of reducing them has been conſidered as ſo great, that in general we have been adviſed to give a very doubtful prognoſis of the event. In caſes of long duration this ſhould always be done: for beſides other cauſes which add to the difficulty of reduction, the muſcles here are ſo ſtrong that they reſiſt, in the moſt powerful manner, every attempt to diſlodge the head of the bone after it has been long fixed among them;

by

by contracting round the neck of the bone, they muſt even be tore aſunder before it can be reduced: But in recent luxations we have not this difficulty to encounter; and we know that with proper management the bone may in almoſt every inſtance be reduced.

The reduction of this bone is always attempted by pulling the limb downward; and it ſeems to be an opinion very univerſally received, that any force we employ ſhould be applied in this direction. Some adviſe the limb to be drawn directly down from the part in which the head of the bone is lodged; others deſire it to be pulled exactly in a line with the hip-joint, while others turn the knee ſomewhat inward. The patient being placed upon his back and properly ſecured, the limb is extended in one or other of theſe directions, either till the reduction is accompliſhed, or till ſuch a force is applied as makes the operator afraid of doing harm were he to proceed farther.

It muſt be allowed that diſlocations of the femur have in various inſtances been reduced in this manner: it might often ſucceed where the head of the bone is forced upwards; but I may without heſitation aſſert, that even in this caſe the reduction might be effected with leſs force in a different manner; and in a great proportion of caſes where the head of the bone is lodged in the foramen ovale, or where it is forced directly downwards, that we muſt neceſſarily fail entirely by confining the line of extenſion to any of the directions we have mentioned.

In whatever way the head of the femur is luxated, it muſt paſs over ſome inequalities or prominent parts of the contiguous bones: Theſe it muſt again paſs over before it be reduced: At leaſt this muſt be the caſe if we wiſh it to return by the ſame route; and it will be admitted in the treatment of luxations to be a good general rule, to endeavour to replace the bone by the opening at which

which it paſſed out. But where the limb is only pulled downward in the uſual way, the head of the bone will be forced againſt the projecting brim of the ſocket if the diſlocation is upward: or it will be drawn to a ſtill greater diſtance from the joint where the bone is diſlocated either directly downward, or lodged in the foramen ovale in the upper and inner part of the thigh. Wherever the head of the bone may be lodged, it ſhould be completely raiſed above any projecting part of the contiguous bones before any other attempt is made for reducing it. As this will remove the principal impediment to the reduction, if the muſcles of the limb be at the ſame time relaxed it will eaſily be drawn into the ſocket when the diſlocation is upward, or puſhed into it where the head of the bone is already beneath it.

In the moſt frequent variety of this luxation, where the head of the bone is puſhed downward and forward, I have ſucceeded in the following manner:

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PLATE. LXXX.

FIG. I.

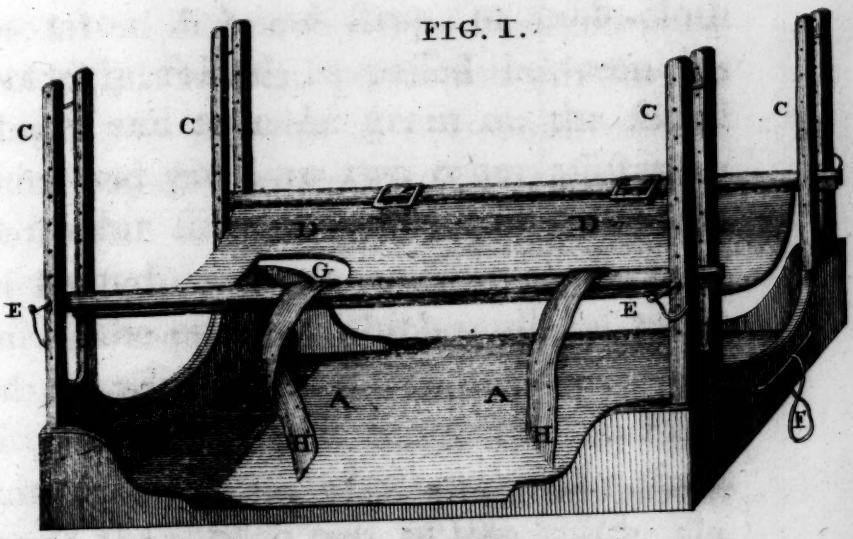
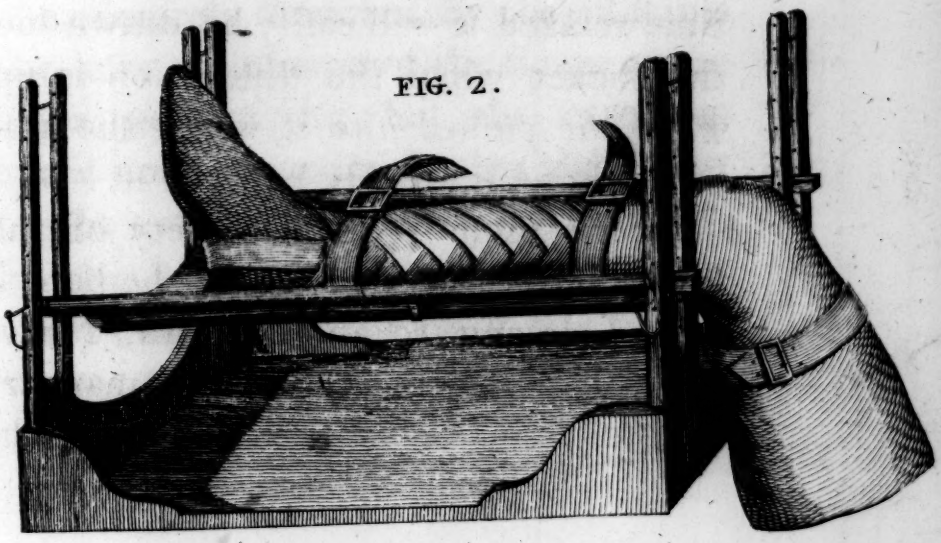
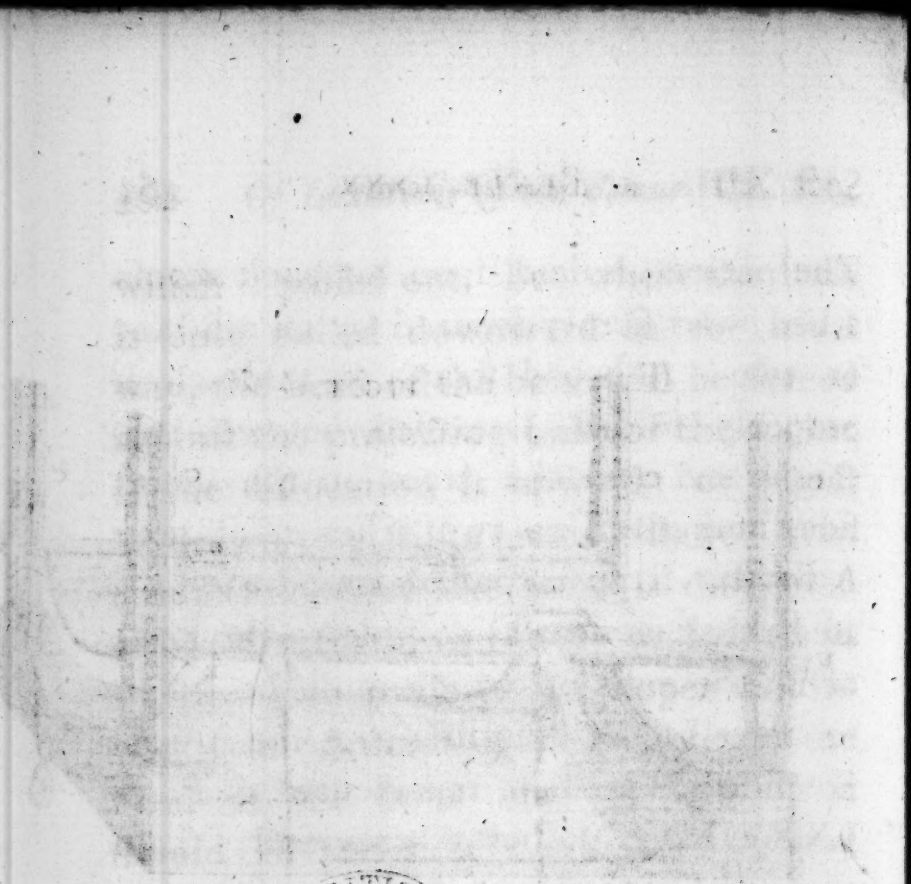


FIG. 2.





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The patient is laid upon his back acroſs a bed, and firmly ſecured by an aſſiſtant or two: A broad ſtrap, or table-cloth properly folded, is paſſed between his thighs and over the groin on the ſound ſide, and given to two other aſſiſtants: A ſimilar ſtrap is paſſed round the luxated thigh as near as poſſible to the head of it; the ends of which muſt be given to an aſſiſtant ſtanding on the oppoſite ſide: The belt repreſented in Plate LXXVII. fig. 3. being previouſly fixed upon the under part of the thigh, the ſtraps connected with it are given to an aſſiſtant or two, while the knee is ſupported by another aſſiſtant with the leg moderately bent. The thigh is now to be moderately ſtretched by the aſſiſtants who have the charge of the ſtraps at the under part of it; but the extenſion ſhould not be carried farther than what may be conſidered as neceſſary for drawing the head of the bone down to the under part of the foramen ovale; and this we may always effect with a very

moderate force. The ſtrap round the root of the thigh muſt now be firmly pulled by thoſe who have the charge of it; who, ſtanding ſomewhat higher than the patient, ſhould draw the thigh upward and inward; and the extenſion ſhould be continued in this direction till there is reaſon to ſuppoſe that the head of the bone is clearly raiſed from the foramen in which it was lodged. At this time the perſon who has the charge of the knee ſhould be deſired to move it ſomewhat inward, and to puſh the thigh upward and obliquely outward: he will do this with the greateſt certainty of ſucceeding if he ſecures the knee with one hand and the foot with the other, at the ſame time that he takes care to keep the leg juſt ſo much bent as may relax all the flexor muſcles without ſtretching the extenſors. If the different aſſiſtants perform their parts properly, the firſt attempt will prove ſucceſsful; but if any of them have failed, particularly if the head of the bone has not been

been ſufficiently raiſed from the hollow in the foramen ovale before being puſhed upwards, the attempt muſt be repeated.

As the head of the bone may for the moſt part be felt outwardly, the ſurgeon may in general aſcertain with certainty whether it be ſufficiently raiſed or not. If he finds it riſe eaſily, the force may be continued till it appears to be about an inch higher than when it was firſt applied: while on the contrary, if it yields with difficulty, there will be reaſon to ſuſpect that ſome part of the head of the bone is fixed or locked in the upper part of the foramen ovale; in which caſe the force in this direction ſhould be diſcontinued, and the other aſſiſtants at the knee being directed to increaſe the extenſion downward, it will afterwards be more eaſily raiſed.

In whatever direction the bone may be diſlocated, this is the point requiring moſt of our attention, to raiſe the head of the bone ſufficiently before any attempt is made to force it into the ſocket.

When

when this is effected, a very ſlight force will in general draw it down when the diſlocation is upward; and when diſlocated downward, whether it be ſomewhat backward or directly on a line with the ſocket, it will be eaſily puſhed up.

In this manner recent luxations of this joint may for the moſt part be reduced; and the ſame treatment is perhaps the beſt even in luxations of long duration. In theſe it will ſometimes fail; but it will ſucceed, I believe, as frequently as any other that has yet been propoſed, while it is not productive of the dreadful pain which commonly enſues from the uſe of ſome of thoſe machines that have been invented for making a greater extenſion of the limb. When any additional force, however, is judged to be neceſſary, it may either be obtained by a proper application of Mr Freke's machine repreſented in Plate LXXVIII. of Mr Petit's in Plate LXXVI. fig. 2. or of the pullies and ropes repreſented in Plate LXXVII.

It ſhould be remarked, however, that no aſſiſtance of this kind can ever be applicable where the luxation is downward. Extenſion of the limb having been conſidered as neceſſary in every variety of luxation, it has often been indiſcriminately employed, whether the head of the bone was placed above or below the ſocket: It is obvious, however, that it is in the former only that it can ever prove uſeful; and in the latter, that much miſchief may enſue from it.

The violent diſtention of the muſcles and extenſive laceration of the articular ligaments, with which luxations of this bone muſt be always accompanied, render much care and attention neceſſary long after the reduction is accompliſhed. Local blood-letting with leeches, or cupping and ſcarifying, proves particularly uſeful here, and ſhould be repeated more or leſs frequently according to the violence of the ſymptoms and age and habit of the patient; and till the parts may be ſuppoſed to have recovered

their tone, the patient ſhould be kept as much at reſt as poſſible.

By many it is imagined that the femur may be partially luxated; and the appearances which are ſuppoſed to ariſe from what is termed a Subluxation of this bone are deſcribed by authors: Of theſe, however, I have taken no notice, as it is not my opinion that this bone can be partially luxated. The head of it is ſo round, and the brim of the ſocket ſo narrow, that whoever examines them with accuracy will be convinced that it cannot happen. The head of the bone may in a gradual manner be puſhed out of the acetabulum by a tumor at the bottom of it, but I do not ſuppoſe that this can ever occur from external violence.

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SECTION XIV.

Of Luxations of the Patella.

THE patella may be either partially or completely luxated, and it may be diſplaced either upward or downward, outward or inward: It may alſo be luxated by itſelf, or it may be diſplaced along with the tibia and fibula in luxations of theſe bones. It cannot, however, be completely luxated in any direction if it be not accompanied with a rupture of the ligament which ties it to the tibia, or of the tendon of the rectus muſcle connected to the upper part of it; or perhaps of both: and it will be more readily diſlocated inwardly than in any other direction, owing to the internal condyle of the femur being ſomewhat leſs prominent than the other:

for as this bone is placed in ſome degree between theſe condyles, it will neceſſarily be moſt eaſily forced out at that ſide where it meets with the leaſt reſiſtance.

Luxations of this bone are for the moſt part eaſily diſcovered, as it is thinly covered with ſoft parts: But when it has been long diſplaced, it is apt to induce ſo much tumefaction, not only about the joint, but over all the contiguous parts, as to be diſtinguiſhed with difficulty. Even the moſt partial luxation of the patella always gives conſiderable lameneſs and much pain on every attempt to move the joint.

In the reduction of a luxated patella, the patient ſhould be placed either on a bed or on a table, and his leg ſhould be ſtretched out and kept in this poſture by an aſſiſtant. The ſurgeon ſhould now lay hold of the bone and endeavour to puſh it into its ſituation; but inſtead of puſhing it directly forward, it ſhould firſt be ſomewhat raiſed, otherwiſe we will

will be apt to force it againſt the condyles of the femur or head of the tibia. The beſt method of effecting this is to preſs down the ſide of the bone moſt diſtant from the joint; by which the oppoſite ſide of it will be elevated, when a very moderate force will preſs it into its place. When the patella is drawn out of its ſituation by the tibia and fibula being diſplaced along with it, it cannot be replaced till the reduction of theſe bones is accompliſhed.

SECTION XV.

Of Luxations of the Tibia and Fibula at the Joint of the Knee.

THE tibia is the only bone of the leg that is immediately concerned in the joint of the knee; but as this bone cannot be diſlocated without drawing the fibula along with it, we think it right to mention them together.

As more ſtrength is required in the knee than in any other joint of the body, the bones of which it is chiefly formed, the femur and tibia, are connected together by the ſtrongeſt kind of articulation, namely by Ginglimus or the Hinge-like joint: the ſurfaces of the two bones are very extenſive, and they are firmly tied together by ſtrong ligaments: There is alſo reaſon to ſuppoſe that the moveable cartilages placed between the ends of theſe bones have ſome influence in leſſening the friction of the joint, and in thus rendering it more firm than it otherwiſe would be.

The great ſtrength of this joint is the reaſon of its being leſs frequently diſlocated than any other in the body: It cannot indeed be completely diſlocated but by the application of ſo much force as will not only rupture the teguments which cover it, but the ſtrong ligaments and tendons which tie the bones together. As this requires a very unuſual degree of violence, theſe bones are ſeldom

dom forced entirely paſt each other; and the ſame reaſon even prevents them from being often partially luxated. When either a complete luxation, however, or a partial one, is produced, it may happen nearly with equal eaſe on either ſide; but the bones will be more readily forced backward than forward, owing to the flexor muſcles and tendons of the leg being much ſtronger than the extenſors.

The moſt partial luxation of this joint is readily diſtinguiſhed, not only by the violent pain which it excites, and the lameneſs with which it is attended, but by the deformity which it produces, and which is always obvious on comparing both knee-joints together.

When the patella is diſlocated at the ſame time with the tibia and fibula, it will for the moſt part be reduced along with theſe bones; but when this does not happen, it may be afterwards replaced in the manner we have mentioned in the laſt Section.

Luxations of this joint are to be re-

duced by fixing the thigh with ſufficient firmneſs, and extending the leg till the ends of the bones are entirely clear of each other; when the tibia and fibula connected with it will be eaſily replaced. In partial luxations, the degree of extenſion neceſſary for this will be inconſiderable; but where the bones are completely diſplaced more force will be required. It is ſcarcely neceſſary to obſerve, that the muſcles of the leg ſhould be as much relaxed as poſſible while the force for extending it is applying.

Scarcely any joint is ſo apt to ſuffer from inflammation as that of the knee: ſo that in all ſuch injuries as this, where the ſurrounding ſoft parts are ſo liable to inflame and become painful, the moſt ſtrict antiphlogiſtic courſe becomes requiſite; local blood-letting ſhould be preſcribed, and repeated according to the violence of the ſymptoms and ſtrength of the patient; and the limb ſhould for a conſiderable time be kept at perfect reſt.

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The upper end of the fibula, as well as the under extremity of it, is ſometimes ſeparated by external violence from the tibia. As the ſymptoms which this excites are ſimilar to thoſe which occur from ſprains of the muſcles, the real nature of the injury is often overlooked. It may almoſt always, however, be diſtinguiſhed by an attentive manual examination. The only method of obtaining relief is by replacing the bone, which for the moſt part is eaſily done, and retaining it with a proper bandage till the parts have recovered their tone.

SECTION XVI.

Of Luxations of the Foot at the Joint of the Ancle.

THE joint of the ancle is formed by the upper part of the aſtragalus or firſt bone of the foot, being received into a cavity in the under extremity of the tibia; which is bounded externally by the end of the fibula, projecting a conſiderable way paſt the end of the tibia.

The aſtragalus may be diſlocated either backward or forward, outward or inward, but it is more frequently puſhed inward than in any other direction. The great ſtrength of the tendo achillis prevents it from ſlipping eaſily backward, and it has alſo ſome effect in preventing it from going forward. It cannot be

puſhed

puſhed outward without breaking the projecting end of the fibula.

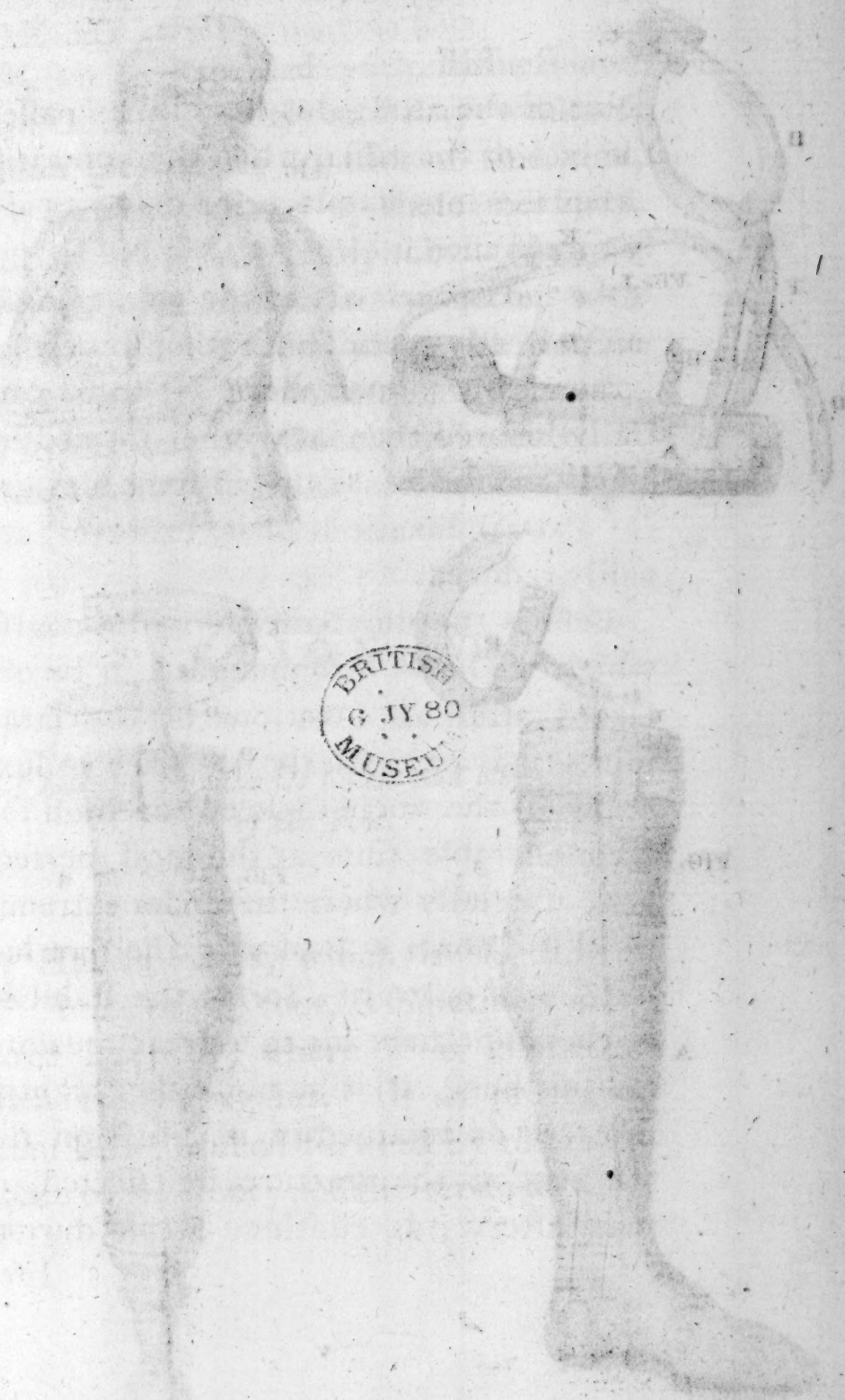
Diſlocations of this joint are in general eaſily diſcovered by the pain and lameneſs which they produce, as well as by the obvious alteration which they occaſion in the appearance of the foot. When the aſtragalus is puſhed forward, the foot appears to be lengthened and the heel ſhortened; when puſhed backward, the foot is ſhortened and the heel lengthened; and when luxated either outwardly or inwardly, there is always a preternatural vacancy on one ſide of the joint and a prominency on the other.

In the reduction of this luxation, the patient ſhould be placed either upon a table or on a bed, and the leg with the knee bent ſhould be firmly ſecured by an aſſiſtant or two. The foot is now to be put into that ſituation which tends moſt effectually to relax all the muſcles which belong to it; and being given to an aſſiſtant, he muſt be deſired to extend it in that direction till the moſt prominent

point of the aſtragulus has clearly paſſed the end of the tibia, when the bone will either ſlip into its place, or may be eaſily forced into it.

As the upper part of the aſtragalus is not perfectly round, but rather ſomewhat hollow, this joint is more apt to be partially luxated than any other formed by a ball and ſocket, as this in ſome meaſure is: Partial luxations of it, however, are eaſily reduced.

Beſides the uſual antiphlogiſtic courſe which we have recommended to be obſerved after all luxations of the large joints, it is particularly neceſſary in luxations of the ancle to keep the limb for a conſiderable time at the moſt perfect reſt, eſpecially where the under extremity of the fibula is broke by the foot being forced outward; for as the ſtability of the joint depends in a great meaſure on this bone, if it be not either rightly replaced or retained in its ſituation till the cure of the fracture be effected, it may afterwards continue weak during life,



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PLATE. LXXXI.

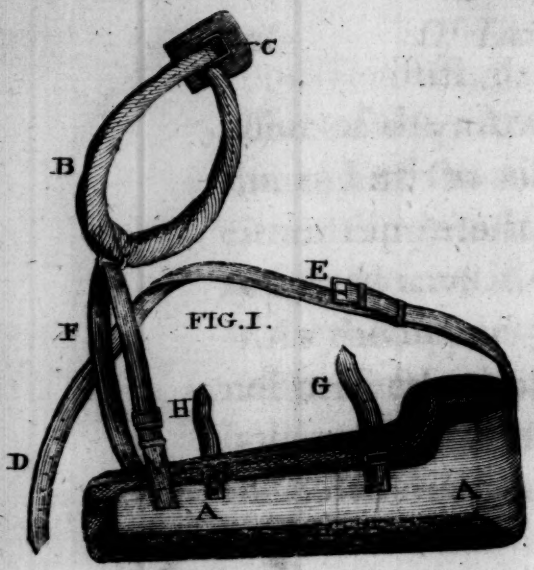


FIG.I.



FIG. 2.



FIG. 3.

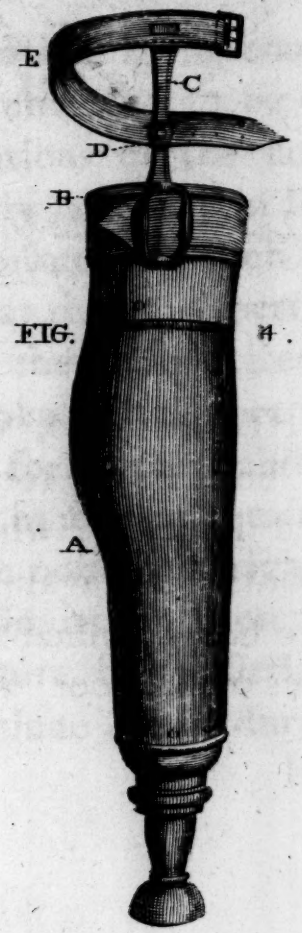


FIG. 4.

life, or be attended with ſtiffneſs and pain to a great height. Any weakneſs which ſucceeds to injuries of this kind, if it be not removed by theſe meaſures, will be moſt effectually obviated by a firm ſplint of thin iron connected with the ſhoe, and applied along the outſide of the leg; or by an inſtrument invented by the late Mr Gooch, repreſented in Plate LXXXIII. fig. 4.

SECTION XVII.

Of Luxations of the Os Calcis and other Bones of the Foot.

THE os calcis, which is the largeſt bone of the foot, is ſometimes diſlocated laterally, where it is connected with the aſtragalus. It is prevented from being puſhed forward by the other bones of the foot; and the tendo achillis,

which is inſerted into a large rough proceſs of this bone, which projects backward and forms the heel, prevents it from being luxated in this direction.

The aſtragalus and os calcis are ſometimes luxated at their junction with the os naviculare and os cuboides; and as this joint, if it may be ſo termed, is at no great diſtance from the ancle, this variety of luxation has, in ſome inſtances, been miſtaken for luxations of that joint. The foot may at this part be puſhed either outward or inward, or it may be forced directly downward: It will rarely be luxated upward, as it can ſcarcely be expoſed to external violence in ſuch a direction as could have this effect.

Luxations of any of theſe bones are readily diſcovered by the pain and lameneſs with which they are always attended; as well as by the alteration which they produce on the ſhape of the foot.

The os calcis, when diſplaced, is more difficult to reduce than almoſt any other bone of the foot: It can only be done by

by fixing the leg and foot in ſuch a poſition as tends moſt effectually to relax the different muſcles which belong to them; and while they are in this poſition, by endeavouring to force the bone into its ſituation: and this will be more readily effected, if during the operation the foot be moderately extended.

In luxations of the aſtragalus and os calcis with the os naviculare and os cuboides, as the anterior part of the foot is apt to be drawn towards the heel, it becomes neceſſary to extend it to ſuch a degree as may clear the bones on the oppoſite ſides of the joint of each other; for till this be done, the reduction cannot be effected, while the bones will immediately ſlip into their ſituation as ſoon as they are drawn paſt each other.

The other three bones of the tarſus, uſually termed the Cuneiform Bones, as well as the Metatarſal Bones, and the Bones of the Toes, are all liable to be luxated, and they may be diſplaced almoſt in every direction. But it is not neceſſary

neceſſary to ſpeak of the method of reducing them; for the obſervations we had occaſion to make on diſlocations of the bones of the hand are equally applicable here: ſo that we ſhall now refer to what was ſaid on that ſubject in the XIIth Section of this Chapter.

CHAP.

CHAP. XLI.

Of DISTORTED LIMBS.

LIMBS may be diſtorted in various ways and by different cauſes; either from a morbid ſtate of the bones, or from a contracted ſtate of the muſcles, or the bones and muſcles may both be affected. In ſome caſes the diſtortion is owing to an original mal-conformation; in others it occurs in infancy, and in ſome at more advanced periods of life.

For a conſiderable time after birth the bones are ſoft and pliable, and are eaſily affected by the poſtures of the body. The bones of the legs are apt to be crooked by children being made to walk too ear-

ly. It is alſo the effect of ſome diſeaſes, particularly of rickets, to ſoften the bones ſo much that they eaſily yield to the poſture of the body, as well as to the ordinary action of the muſcles. But the moſt frequent cauſe of diſtorted limbs is that contraction of the flexor muſcles of the leg and fore-arm, which is often induced by an inflamed ſtate of the knee and elbow, and of which we have a very common example in thoſe caſes of white ſwelling to which theſe joints are more particularly liable. As the limb lies eaſieſt while the muſcles are relaxed, the patient naturally keeps it always bent; and when this poſture is long continued, it almoſt conſtantly terminates in ſuch a rigid contracted ſtate of the flexor tendons, as keeps the under part of the limb at an angle with the ſuperior part of it: Of this we meet with daily inſtances in the leg; where from this cauſe alone a patient is often altogether deprived of the uſe of his limb.

As

As it has been a very prevailing opinion among practitioners, that little or no advantage can be obtained from any remedies that we may employ for diſtorted limbs, they have ſeldom made any attempt to cure them. In conſequence of which this branch of practice has been almoſt univerſally truſted to itinerants or to profeſſed bone-ſetters. In this, however, we are wrong; and in ſaying ſo, I can ſpeak with confidence from much experience in caſes of this kind: Having early in life obſerved the miſery to which patients with diſtorted limbs were reduced, I was reſolved to make ſome attempts for the relief of ſuch as might apply to me, however ſmall the chance might be of ſucceeding; and in various inſtances I have had the ſatisfaction of relieving, and in ſome caſes of curing completely, patients who had been lame for ſeveral years, and where it was not expected that any thing could be done for their advantage. Where an anchyloſis is formed by the ends of two

bones forming a joint having adhered together, it would be in vain to make any attempt to remove it, unleſs the inconveniency attending it be very great: In which caſe, if it be the patient's deſire, it may be a reaſon for amputating the limb; or in particular inſtances, it may be removed by taking out the ends of the bones forming the joint, in the manner to be afterwards pointed out in the laſt Section of Chapter XLIII. But when the ſtiffneſs of a joint depends on a contracted ſtate of the muſcles and tendons that ſerve to move it, which is by much the moſt frequent cauſe of diſtorted limbs, we may almoſt in every inſtance afford conſiderable relief: And where a limb is crooked by a bone being bent, whether it may have happened from improper management during childhood, or as the effect of rickets, or any other diſeaſe, we may very commonly, by timeous attention, either remove it entirely, or render it much leſs conſiderable.

Where a limb is diſtorted from a ſtiff con-

contracted ſtate of the muſcles and tendons which belong to it, a free uſe of emollients, with a moderate gradual extenſion, is the remedy from which I have derived moſt advantage, and which never in any inſtance does harm. Thoſe who have not been in the practice of uſing emollients for this purpoſe, may imagine that they will not penetrate to the depth of the muſcles and tendons; and when I firſt employed them, I muſt own that I did not expect they were to do ſo in any remarkable degree: But as I did not know any other remedy that was likely to lubricate ſo effectually parts that were become ſtiff, I was reſolved to give them a complete trial; and I was ſoon convinced that the moſt beneficial effects might be expected from them. In a former publication I had occaſion to mention this, and ſince that period various opportunities have occurred of employing the ſame remedy with advantage*.

In order, however, to gain this end, emol-

* *Vide* A Treatiſe on Ulcers, &c. Part III.

emollient applications muſt be uſed in a very ample manner. All the contracted muſcles and tendons, from their origins to their inſertions, muſt be well rubbed with the emollient we are to employ for at leaſt half an hour three times a-day; and the limb ſhould be kept conſtantly moiſt with, or as it were immerſed in, the emollient, by being covered with flannel well ſoaked in it at every repetition of the frictions. While the frictions are applying, the limb ſhould be ſlowly, tho' firmly, extended, to as great a degree as the patient can eaſily bear; and the inſtrument repreſented in Plate LXXIX. fig. 1. may be afterwards applied, in order to prevent the muſcles from contracting.

It is neceſſary, however, to remark, that the extenſion ſhould not be made quickly: By doing ſo, much miſchief has been often produced, inſomuch that joints have become pained and inflamed, where there was not previouſly any other diſeaſe than ſtiffneſs of the flexor muſcles; while

while it may be done with the utmoſt ſafety in the ſlow gradual manner I have mentioned. In the one way, indeed, ſeveral months may be required for effecting what a greater force might accompliſh in as many weeks: but the latter muſt always be attended with pain and hazard, while with the other we proceed with eaſe and ſafety.

Even where extenſion is not neceſſary, the effects of emollients are often conſpicuous. We frequently meet with ſtiff joints, particularly in the ancle, without any contraction or diſtortion of the limb. In this caſe, emollients alone, if duly perſiſted in, will commonly anſwer the purpoſe of relaxing them.

Every kind of greaſy application will be uſeful here, but animal fats prove more relaxing than vegetable oils. The greaſe of geeſe and ducks and other fowls anſwers well; alſo hogs-lard, and the oil obtained from boiling recent bones of beef and mutton in water. Butchers uſually keep this oil in quantities: When pro-

perly prepared, it is quite pure and tranſparent, and has no ſmell.

Where the diſtortion of a limb proceeds from a bone being bent, if this is not of long duration, and eſpecially when it occurs in childhood, we may very frequently be able to remove it by making a conſtant preſſure, gradually increaſed, on the convex ſide of the limb, till the bone is brought into its natural direction.

This kind of deformity occurs frequently in patients labouring under rickets; but we find it moſt commonly in new-born children, either from an original mal-conformation, as we obſerved above, or from ſome ſingularity in the ſituation of the child while in the womb. It is moſt frequent in the legs, when it alſo affects the direction of the feet and ancles. When the bones of the leg are bent outward, the foot is turned inward; and *vice verſa*, the foot is turned outward when the leg is bent inward. Patients affected in this laſt manner are called

called Valgi, and Vari when the feet are turned inward.

Theſe diſtortions of the feet and ancles have been ſuppoſed to originate in almoſt every inſtance from a mal-conformation of the joint of the ancle; and the means that have been propoſed for removing them have been intended to effect an alteration of that joint: They may in ſome caſes ariſe from this cauſe, but I have ſcarcely ſeen an inſtance of it. At firſt view of the diſeaſe, we are indeed apt to imagine that the fault lies chiefly in the ancle; but it will be very univerſally found, on a more narrow inſpection, to proceed from the form of the leg. When the leg is bent outward, the toes are turned inward, and the ſide of the foot downward; or if the curvature of the leg be conſiderable, the ſole of the foot will be turned nearly altogether upward, while the top of the foot will reſt on the ground on every attempt to walk: And on the contrary, when the bones of the leg are bent inward, the toes

toes and ſole of the foot will be turned outward and upward.

Whoever will examine with attention the effect produced upon the foot by the bones of the leg being curved in the manner I have deſcribed, will find that the maladies we are now conſidering muſt neceſſarily reſult from it: And although it may happen, in a few caſes, that the joint of the ancle is affected by a long continuance of the diſtortion, yet in almoſt every inſtance the diſeaſe will be found to proceed originally from the cauſe I have mentioned: ſo that in the management of the diſorder, our views ſhould be chiefly directed towards this affection of the leg. By removing the curvature of the bones the foot will gradually regain its natural ſituation, while all our endeavours will prove fruitleſs if we only attempt to alter the direction of the ancle-joint.

When caſes occur of the foot and toes being turned inward, ſolely from a malconformation of the ancle-joint, it will no

no doubt be neceſſary to endeavour to give the joint a better direction; but as I never met with an inſtance of this, I muſt leave the particular mode of effecting it to thoſe who may happen to ſee it. The eaſieſt and moſt effectual way of applying preſſure to the bones of the leg when bent, is by fixing a firm ſplint of iron in the ſhoe, on the concave ſide of the leg: and if the head of the ſplint be made to reſt againſt the correſponding condyle of the femur, and the other end of it upon the foot, an eaſy gradual preſſure may be made upon the oppoſite ſide of the leg by one or two broad ſtraps paſſed round both the leg and the ſplint. If the ſplint is covered with ſoft leather and properly fitted to the parts, it gives no uneaſineſs; and by drawing the ſtrap ſurrounding it and the leg a little tighter from time to time, the preſſure will be increaſed in the gradual manner I have mentioned. In Plate LXXXIII. an apparatus is repreſented; which in one caſe, where the curvature of the leg was very conſiderable, and

where

where the ſole of the foot was turned almoſt entirely upwards, anſwered the purpoſe very completely. It is ſometimes ſufficient to fix the ſmall end of the ſplint in the ſhoe, and the broad flat pad at the top on the condyle of the femur. A ſplint for this purpoſe is repreſented in fig. 2. This gives it two fixed points, by which we have it in our power to make any neceſſary preſſure with the ſtraps paſſed round the leg: but in ſome inſtances, as in the one I allude to, the ſole of the foot cannot be kept ſo much down as to admit of this, without fixing the ſhoe to a frame, as is repreſented in fig. 3. for in every caſe of this nature, the ſole of the foot ſhould be kept as much as poſſible in a natural ſituation, otherwiſe the preſſure made upon the leg for removing the curvature in the bones will be apt to give a wrong direction to the joint of the ancle by the under end of the ſplint, which in this caſe muſt be made to reſt upon it.

I have thus given a general view of the

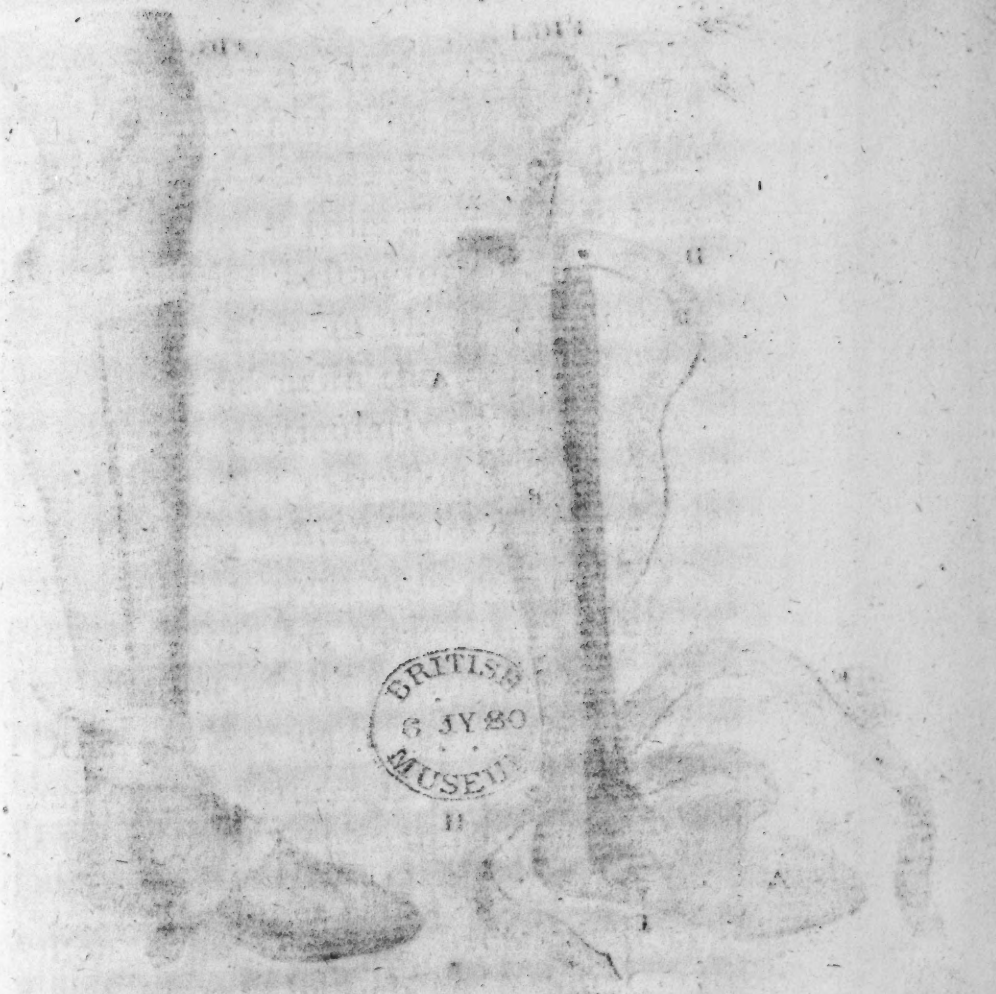

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PLATE LXXXII.

FIG. 1.

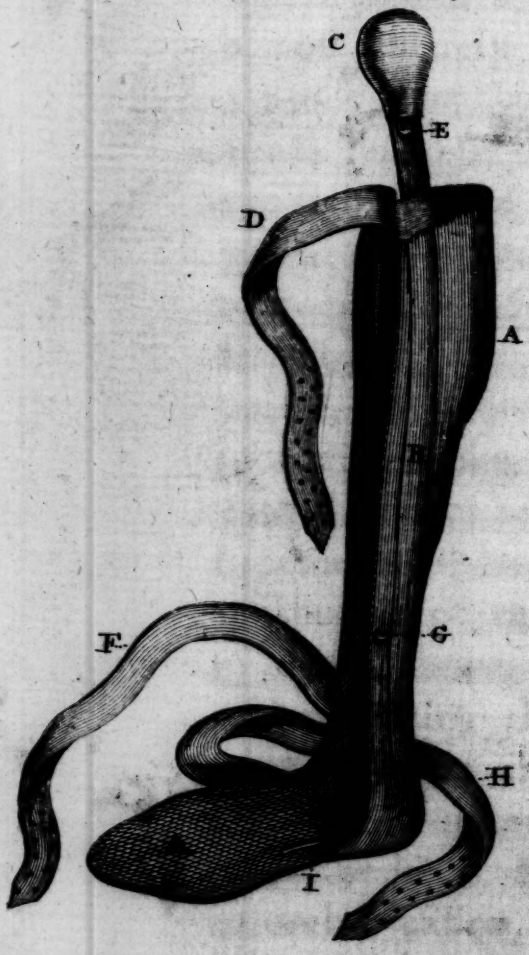


FIG. 2.



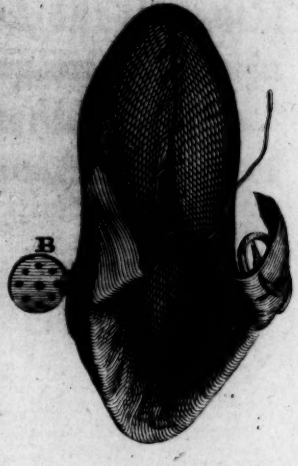
FIG. 3.



FIG. 5.



FIG. 4.



the idea I entertain of the nature of this affection, and of the management beſt adapted for removing it: But whether limbs be diſtorted from a contracted ſtate of the muſcles belonging to them, or from a curvature in the bones, much variety muſt occur in the application of the remedy, particularly in the manner of applying the extenſion. The treatment, indeed, which ſuits one caſe is ſeldom exactly applicable to another; it muſt therefore be varied according to the judgment of the practitioner.

Other modes have been propoſed for removing curvatures in bones: Of theſe the beſt I have ſeen is an invention of an ingenious artiſt of this place, Mr Gavin Wilſon, who has long been much employed in this branch of buſineſs. In Plate LXXXII. figs. 1. and 2. I have repreſented one of Mr Wilſon's inſtruments for diſtortions of the leg.

CHAP.

CHAP. XLII.

Of DISTORTIONS *of the* SPINE.

THE ſpine may be diſtorted in various directions, outwardly, inwardly, and laterally; and in ſome caſes we meet with it in all theſe directions at the ſame time and in the ſame perſon. This ſometimes ariſes from external violence; but it is more frequently a ſymptom of a weakly, delicate conſtitution.

Beſides the deformity which theſe diſtortions produce, they are very apt to injure the health, by compreſſing the abdominal and thoracic viſcera, and by inducing paralytic affections of the lower extremities, from the preſſure which they

make upon the nerves which ſupply thoſe parts. They occur in all ages; but more frequently about puberty than at any other period, and more commonly in girls than in boys. In general, the effects which reſult from them are obſerved before the cauſe is ſuſpected; for there is ſeldom much pain in the part immediately affected.

When diſtortion of the ſpine occurs during infancy, the patient appears to be ſuddenly deprived of the uſe of his limbs; but at more advanced periods, he complains for ſome time of feebleneſs and languor, and of numbneſs or want of feeling in the under extremities. By degrees this want of ſenſibility is found to increaſe; and he is often obſerved to ſtumble and to drag his legs inſtead of lifting them cleverly, nor can he ſtand erect for any length of time but with much difficulty. At laſt he loſes the uſe of his legs entirely, which become altogether paralytic; and when the ſpine is diſtorted much forward, ſo as to compreſs the viſcera

cera of the thorax or abdomen, he becomes diſtreſſed with dyſpnæa, or complaints in the ſtomach and bowels, according to the part of the ſpine that is affected.

In ſome caſes the loſs of power in the extremities takes place in the courſe of a few days from the firſt approach of the diſeaſe; and it ſometimes becomes gradually leſs remarkable, although it never is, ſo far as I have obſerved, entirely removed.

When the deformity in the back is diſcovered, we ſometimes find that one of the vertebræ only is diſplaced; on other occaſions two or more are affected; and in ſome caſes there is reaſon to imagine that it ariſes ſolely from a thickening of the ligaments which connect the vertebræ together, without any particular affection of the bones. When one of the vertebræ only is affected, it is obſerved that the patient is more completely deprived of the power of his limbs than when two or more of them are diſplaced, owing perhaps to the angle being

PLATE LXXXIII.

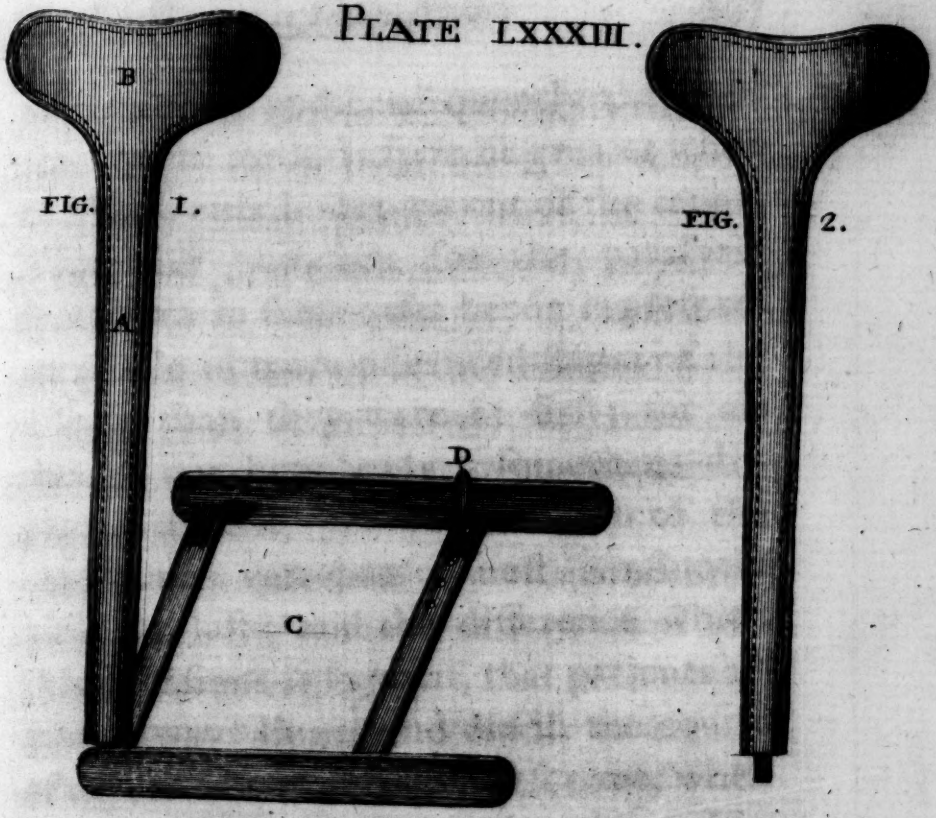


FIG. 1.

FIG. 2.



FIG. 3.

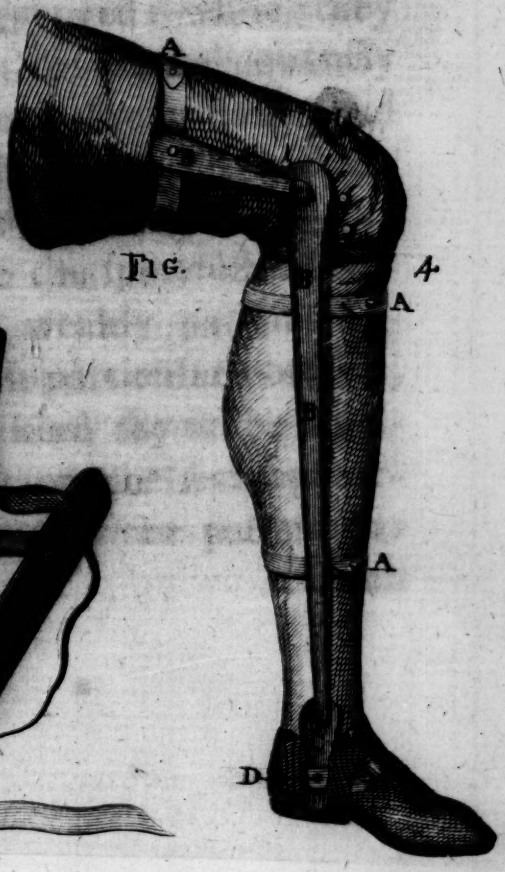


FIG. 4.

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more acute, and conſequently the preſſure on the medulla ſpinalis greater when one bone only is thrown out of the range. This alſo accounts for the paralytic ſymptoms in ſome caſes becoming leſs remarkable in more advanced ſtages of the diſeaſe than they were at firſt; for although one bone only is ſometimes diſplaced at firſt, yet one or both of the contiguous vertebræ almoſt conſtantly yield at laſt; and the difference which this occaſions is ſo great, that patients almoſt always linger and die in the courſe of a year or two, often in leſs time, when one bone only is deranged; while they live for a great length of time, frequently as long as if no ſuch circumſtance had occurred, when the curvature of the ſpine becomes more extenſive.

As diſtortions of the ſpine often proceed from delicate weakly patients indulging too much in particular poſtures, every habit of this kind ſhould be rigidly guarded againſt on the firſt appearance of the diſorder. If the patient has

been accuſtomed to lean much to one ſide, the reverſe of this ſhould be adviſed; and that the body may lie as much as poſſible upon an equal ſurface, during ſleep he ought to uſe a hair mattraſs laid upon boards inſtead of a feather or down bed.

By attention to theſe points; by the uſe of an invigorating diet; the cold bath; bark, and other tonics; the diſorder has been in ſome caſes prevented from advancing ſo far as it otherwiſe probably would have done: but where any of the bones have been affected, I have never ſeen an inſtance of a complete cure being obtained. Mr Pott, to whoſe obſervations upon this ſubject we are much indebted, ſpeaks highly of the effect of drains placed as near as poſſible to the tumor. He adviſes an iſſue to be opened with cauſtic on each ſide of the tumor, large enough to admit a kidney-bean, and the bottom of the ſore to be ſprinkled from time to time with powder of cantharides. This I have practiſed in various

ous caſes, and in ſome inſtances with obvious good effects: But in all of theſe there was reaſon to ſuppoſe that the ſeat of the diſorder was in the ligaments, and not in the bones of the ſpine. When they have appeared to prove uſeful where the bones have been affected, I conclude that the mitigation of ſymptoms has ariſen from the cauſe I have mentioned, the preſſure upon the ſpinal marrow being leſſened in the progreſs of the diſorder.

Various machines have been invented for the removal of diſtortions of the ſpine by preſſure: All of theſe, however, do harm, and ought never to be uſed. It muſt at once appear, to whoever is acquainted with the anatomy of theſe parts and with the nature of this diſeaſe, that the diſplaced bone is never to be puſhed into its ſituation by any aſſiſtance of this kind; and if this cannot be accompliſhed, it is obvious that no advantage is to be derived from the practice, while it is evi-

dent that much miſchief may enſue from it.

In all diſtortions of the ſpine, it is an object of the firſt importance to ſupport the head and ſhoulders. If this be not duly attended to, the weight of the head tends almoſt conſtantly to increaſe the diſorder. The collar uſually employed for this purpoſe anſwers nearly as well as any other. In Plate LXXXVIII. fig. 1. a repreſentation is given of one with ſome improvements, by which both the head and ſhoulders may be very effectuallyſupported; and in fig. 3. another is delineated for ſupporting the ſhoulders only.

CHAP.

CHAP. XLIII.

Of AMPUTATION.

SECTION I.

General Remarks on the Operation of Amputation.

BY the term Amputation, we uſually underſtand the removal of a limb. We ſpeak of the Extirpation of a tumor; of the mamma; of a teſtis; but we ſay the Amputation of a leg and of an arm.

The mutilation, which is a conſequence of this operation, renders it one of the moſt dreadful in the practice of ſurgery; yet as the only means by which life can be ſaved, it is frequently neceſſary. It is

an operation, however, ſo repugnant to humanity, ſo diſtreſsful to the unfortunate ſufferer, and in ſome circumſtances ſo fraught with danger, that nothing but a clear conviction of this neceſſity can warrant our propoſing it in any caſe.

The operation indeed is not difficult: every practitioner accuſtomed to handle inſtruments may perform it. But to diſtinguiſh with preciſion the caſes which require it from thoſe which might do well under a different treatment, and to determine the particular periods of each when it ought to be performed, are circumſtances which require more deliberation than perhaps any other in ſurgery: We ſhall therefore enumerate the cauſes which may make amputation neceſſary, before proceeding to deſcribe the method of performing it.

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SECTION II.

Of the Cauſes which may render Amputation neceſſary.

THIS operation may be rendered neceſſary by various cauſes; all of which may be comprehended under the following heads.

1. Bad compound fractures.
2. Extenſive lacerated and contuſed wounds.
3. A portion of a limb being carried off by a cannon-ball, or in any other manner, if the bones be unequally broke and not properly covered.
4. Extenſive mortification.
5. White ſwellings of the joints.
6. Large exoſtoſes, whether they be confined to joints, or ſpread over the whole bone or bones of a limb.

7. Caſes of extenſive caries, accompanied with bad ulcers of the contiguous ſoft parts.
8. Cancer, and ſome other ulcers of an inveterate nature.
9. Various kinds of tumors.
10. Particular diſtortions of a limb.

Each of theſe cauſes we ſhall conſider in the order they are here mentioned.

In Chapter XXXIX. Section XV. we had occaſion to ſpeak particularly of compound fractures: I ſhall at preſent therefore only remark, as the ſubſtance of what was then fully pointed out, that in the army and navy, where ordinary patients cannot be duly attended, and where they muſt be much jolted, and often removed from place to place, immediate amputation ſhould be adviſed in caſes of compound fractures that are in any degree formidable. Caſes will often indeed occur in the worſt ſituations, in which it will be improper to amputate the limbs. Thus, in a compound fracture, where little violence has been done, and where the bones have been

been broke ſo much in a tranſverſe direction, that when replaced, they ſupport each other with firmneſs, and eſpecially if one bone only is broke, it would no doubt be a ſevere, and often an unneceſſary meaſure, to propoſe the removal of the limb: But whenever much violence has been done to a limb; when the bones are broke in ſuch a manner that they do not, even when exactly replaced, ſupport each other firmly; in all ſuch ſituations, I believe, it would be a good general rule to adviſe immediate amputation. Unleſs the operation, however, can be performed ſoon after the accident, it cannot again be admiſſible for a conſiderable time; for whenever a limb has become ſwelled and inflamed, it can never, but with the utmoſt danger, be taken off till theſe ſymptoms ſubſide.

In private practice, however, where the patient can from the firſt be placed in an eaſy comfortable ſituation, from which he need not be removed till his cure be completed; where he can be kept

kept perfectly quiet, and have all the advantages of good air, a proper regimen, and the aſſiſtance of able practitioners, very few caſes will occur in which amputation ſhould be adviſed. The only cauſe, as I have obſerved elſewhere, which in ſuch circumſtances can render immediate amputation proper, is the bones of a limb, together with the muſcles and other ſoft parts with which it is covered, being ſo ſhattered and bruiſed that there will be no chance of the limb being rendered uſeful by any attempt that might be made to ſave it: In ſuch circumſtances it ſhould be removed immediately; but this not being done, the operation, as we have obſerved above, muſt be delayed, till the ſwelling, inflammation, and fever induced by the accident, be removed.

Although early amputation, however, is ſeldom neceſſary in private practice, yet, in the after treatment of compound fractures, it is ſometimes proper:

1. In conſequence of profuſe hæmorr-

hagies, which cannot otherwiſe be ſtopped. Theſe ſometimes happen from one or more arteries being cut by the ends of the fractured bones, as well as from other cauſes.

2. In conſequence of extenſive mortification. This we ſhall have occaſion to conſider more particularly when we ſpeak of mortification as one of the general cauſes of amputation.

And, 3. By the ends of the fractured bones remaining long diſunited, attended with the diſcharge of ſuch large quantities of matter that the patient runs ſome riſk of ſinking under it.

We have elſewhere obſerved, that fractures are ſometimes prevented from uniting by a looſe portion of bone being left, which ought to have been removed; and nothing more readily keeps up a profuſe diſcharge of matter: But when all ſuch pieces of bone have been removed; when no union takes place; or when the diſcharge ſtill continues in ſuch quantities as to weaken the patient, notwithſtanding every thing that can be done

done to prevent it; ſuch as preſerving the limb ſteadily in one poſture, regular dreſſing of the ſore as often as may be neceſſary, a nouriſhing diet, and a plentiful uſe of bark; nothing will in ſuch circumſtances ſo certainly ſave the patient as the removal of his limb.

We mentioned extenſive laceration and contuſed wounds as the ſecond general cauſe of amputation. Wounds not accompanied with fractures of the contiguous bones are ſeldom ſo bad as to require amputation in any ſtage of them: But when a limb is ſo ſeverely lacerated or contuſed as to have all the large blood-veſſels belonging to it deſtroyed, ſo as to leave no ground of hope that the circulation can be preſerved in it, immediate amputation ſhould be adviſed, whether the bone be ſafe or not. As in ſuch circumſtances no effort on the part of the practitioner could ſave the limb; and as wounds of this deſcription are more apt to terminate in mortification than

than any other, the ſooner the operation is performed the better.

It will alſo happen in lacerated and contuſed wounds, that amputation may afterwards be rendered neceſſary, although it did not appear to be ſo at firſt. In this reſpect they are ſimilar to compound fractures; and the ſame obſervations will apply to them. Hemorrhagies may occur which cannot be ſtopped; extenſive mortification may take place; and ſuch large quantities of matter may form, that the patient will not be able to bear up under the diſcharge. In any of theſe events, we have to conſider the removal of the limb as the only remedy.

The removal of a portion of a limb by a cannon-ball or other violence, we mentioned as the third general cauſe of amputation.

This is one of thoſe caſes which many contend can never require amputation: for the limb being already removed, it will be better, they allege, to endeavour

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to heal the ſore, than to add to the pain and danger of the patient by an operation. The argument is plauſible, but it will not bear examination.

In wounds of this kind the bones are commonly much ſhattered, and even ſplintered; and the muſcles and tendons are left of unequal lengths, and much lacerated and contuſed. In this ſituation, it is allowed by all, that the ſeparate pieces of bone, as well as the ſharp ends of the remaining bone, ſhould be removed, together with the ragged extremities of the muſcles and tendons. Now all this could ſeldom, I believe, be done in leſs time than the operation itſelf; while by amputating above the injured part, and by covering the bone with ſound muſcles and ſkin, we diminiſh the ſore ſo much that it will probably heal in a third part of the time that the original wound would have required; at the ſame time that the patient will have a good ſtump, which in the other method he never could have. With me this

this argument of itſelf would be ſufficient for adviſing the operation under the circumſtances we are deſcribing: for as I do not ſuppoſe it would add to the patient's riſk, any additional momentary pain it might occaſion would be amply compenſated by the advantage he would afterwards derive from it. When the practitioner has it in his power, the operation ſhould be adviſed immediately: for however neceſſary it might be, many patients would not afterwards have ſufficient firmneſs of mind to ſubmit to it; and, from ignorance of the advantages to be derived from it, would prefer preſent eaſe to future conveniency and advantages, however great they might be.

4. Mortification is the next cauſe we have to conſider by which amputation may be rendered neceſſary. They who are determined to oppoſe the practice of amputation as much as poſſible, affect to conſider it as unneceſſary in mortification: for all the leſſer degrees of it, they obſerve,

obſerve, may be cured; and when very extenſive, that the patient will commonly fall a ſacrifice to the diſeaſe, whether the operation be performed or not. This opinion, however, is ſo directly contrary to fact, and to the experience of every unprejudiced practitioner, that we ſhall not attempt to refute it: for although it would be highly improper to adviſe the removal of a limb in ſlight degrees of gangrene; yet when it has ſpread ſo extenſively as to deſtroy all or even a great proportion of the ſoft parts of a limb, an occurrence too frequently met with, what remedy could be employed inſtead of it? As I know of none, and as I never heard of any which could in any way prove uſeful, I ſhall conclude, that in mortification proceeding to ſuch an extent as we have mentioned, amputation of the limb becomes indiſpenſable.

But although this doctrine will be generally admitted, yet practitioners are not agreed with reſpect to the period of mortification at which the operation

ſhould be performed. Some contend, that in almoſt every caſe of gangrene, and eſpecially where it ariſes from external violence, the limb ſhould be amputated as ſoon as mortification is evidently formed, and while it continues to ſpread: Others are of opinion, that amputation ſhould never be adviſed till the gangrene is not only ſtopped, but till the gangrenous are ſeparated from the remaining ſound parts.

Thoſe who adviſe immediate amputation obſerve, that by taking the limb off above the diſeaſed part, we may prevent the progreſs of the mortification, and may thus ſave the patient's life. Altho' the argument is ſpecious, it does not appear to be well founded; and ſo far as my obſervation goes, I would ſay that it is a practice fraught with danger, and ought univerſally to be diſcarded: For however attentive we may be in amputating at a part of the limb which appears to be ſound, even the moſt experienced practitioner will be liable to be

deceived. The ſkin may be perfectly ſound, and may be free from pain, inflammation, and ſwelling; and yet the deep-ſeated muſcles and other parts contiguous to the bone may be in a ſtate of gangrene. Of this I have ſeen different inſtances: But even where the whole divided parts are found to be altogether ſound, if the operation is performed while mortification is advancing, the diſeaſe ſcarcely ever fails of ſeizing the ſtump; at leaſt I never knew an inſtance of the contrary, and I have unfortunately happened to be concerned in different caſes where this practice was adopted. On converſing with practitioners, who, from peculiarity of ſituation, have much employment in thoſe accidents which are moſt apt to terminate in gangrene, I alſo find that their experience tends to ſupport this opinion: It was alſo the decided opinion of the late Mr Sharpe, as it is of Mr Pott, and of every modern practitioner of obſervation*.

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* Mr Pott's words upon this point are very ſtrong:

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I think it right to mention this, as attempts have of late years been made by ſome ſpeculative practitioners to introduce a contrary practice; which, if admitted, there is much reaſon to ſuſpect would prove extremely hurtful, although from its proving ſo univerſally unſucceſsful, there is reaſon to hope that it will ſoon be laid aſide, even by thoſe who at preſent patronize it.

I would not think it neceſſary, however, to delay the operation ſo long as is adviſed by ſome practitioners, and particularly by Mr Sharpe; who thinks that it ſhould never be performed till the ſeparation of the mortified parts is conſiderably advanced*. As Mr Sharpe was a man of much experience, his obſervation may prove to be well founded; but

"I have more than once ſeen the experiment made of "amputating after a gangrene has been begun; but I "never ſaw it ſucceed:—It has always hurried the "patient's deſtruction."— *Vide* Remarks on Fractures, &c.

* *Vide* Treatiſe on the Operations of Surgery, Chap. XXXVII.

ſo far as I have yet ſeen, I would conſider it as ſufficient to wait till the mortification is fairly ſtopped, but not much longer: In this manner, we ſeem to reap all the advantages which the caution we have adviſed can give; and the earlier after this that the mortified parts are removed, the more readily will we prevent the ſyſtem from ſuffering by the abſorption of that putreſcent matter which a gangrenous maſs univerſally yields.

The opinion we have given relates to every variety of gangrene. In whatever way it may have ariſen, the practice ſhould be the ſame; for although ſome ſtreſs has been commonly laid upon the circumſtance of its proceeding from an internal or external cauſe, yet no utility is derived from this. The operation ſhould in no inſtance be adviſed till the period we have mentioned; and at that time, whatever may have been the cauſe of the diſeaſe, no delay ſhould be admitted.

5. In mentioning white ſwellings of the joints as a cauſe of amputation, we muſt

muſt refer to a former publication for the management of the diſeaſe, as well as for a more particular account of thoſe ſymptoms which more eſpecially indicate the operation*. At preſent we have only to obſerve, that as long as there is the leaſt reaſon to hope that by any means the limb may be ſaved without hazard to the patient, the operation ſhould never be adviſed. As a farther motive for this, I may remark, that the opinion I gave in the Treatiſe alluded to above, has been greatly confirmed by much experience, namely, that amputation more frequently ſucceeds, that is, a greater proportion recover from the operation when it is delayed till the patient is conſiderably reduced by the diſeaſe, than when it is performed in the more early ſtages of it. The cauſe of this may be nearly the ſame as what we have given above, when adviſing late Amputation in caſes of Compound Fractures.

 6. In

* *Vide* Treatiſe on the Theory and Management of Ulcers, &c. Part III.

6. In one of the preceding Chapters, we have entered upon the conſideration of the various kinds of exoſtoſis*; ſo that at preſent we have only to remark, that when a diſeaſed portion of bone cannot be taken out in the manner we have formerly adviſed, and when the tumor is either hurting the patient's health or has become unſupportable from its ſize or any other circumſtance, amputation of the limb, when no particular reaſon prevents it, ſhould be adviſed as the only remedy.

7. The next cauſe we have mentioned by which amputation may be rendered neceſſary is, an extenſive caries attended with ulcers of the contiguous ſoft parts. When ſpeaking of caries, in the ſeventh Section of the Treatiſe on Ulcers, we pointed out the different means employed for the cure of the diſeaſe, that is, for promoting an exfoliation of the diſeaſed part of the bone. In addition to what we had then occaſion to ſay, it may be ob-

* *Vide* Chapter XXXVIII. Section III. § 14.

obſerved, that although an extenſive caries is in general conſidered of itſelf as a ſufficient reaſon for amputating a limb, yet it certainly ſhould be admitted under much reſtriction. However extenſive a caries may be, even although it occupies the whole length of a bone, it may be removed; and we have many inſtances on record of deficiencies produced in this manner being amply ſupplied by a regeneration of bone: So that where the conſtitution is ſound, and more eſpecially when the patient is young, a carious bone will ſeldom of itſelf prove a ſufficient motive for removing a limb, at leaſt the chance of ſaving it by removing the diſeaſed bone ſhould firſt be given. But when a carious bone is conjoined with deep and extenſive ulcers of the correſponding ſoft parts, which might give much cauſe to ſuſpect that a cure would not be obtained even although the diſeaſed bone ſhould be taken out, amputation ſhould be preferred; for in this ſituation, beſides the difficulty of

healing the ſores, the formation of any conſiderable quantity of bone would be rendered very uncertain, and therefore the riſk ſhould not be incurred.

8. The next cauſe we have to advert to by which amputation may be rendered neceſſary, is cancer, and ſome other ulcers of an inveterate nature.

When ſpeaking of Cancer in the Treatiſe on Ulcers, we endeavoured to ſhow, that no dependence is to be placed either upon internal medicines or outward applications in the treatment of it; and that the removal of the diſeaſed part is alone to be truſted. It muſt be acknowledged that cancer does not frequently occur on any of the extremities: but every practitioner muſt have ſeen it on different parts of them; and wherever it appears, the removal of the diſeaſed parts with the knife ſhould be adviſed immediately. They may be often taken away without amputating the limb; but when the diſorder has proceeded ſo far as

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to attack the ligaments or bones, and eſpecially when the ſore is extenſive, nothing but the removal of the limb above the parts that appear to be affected can be depended on. In ſuch circumſtances, I have known attempts made to ſave the limb, but always without ſucceſs. Even the removal of the limb will ſometimes fail; but I have known it prove effectual where the diſeaſe had returned, after being removed in the uſual way.

Beſides cancer, other ulcers may, in particular circumſtances, render amputation neceſſary: Where an extenſive ulcer, not induced by any general affection of the ſyſtem, is hurting the health of a patient; and when, inſtead of yielding to the remedies employed, it becomes evidently more extenſive and more inveterate, as it might at laſt proceed ſo far as to endanger life; we ought rather to adviſe the limb to be taken off. Such ulcers as are uſually termed Phagadenic ſometimes terminate in this manner:

But

But this termination is moſt frequent in ſinuous ulcers; ſuch as ariſe from deep-ſeated abſceſſes, where the matter has found acceſs between the interſtices of the large muſcles, and where, notwithſtanding our endeavours to accompliſh a cure, the diſcharge continues to be ſo profuſe as to endanger the life of the patient.

9. The next cauſe we have mentioned which may require amputation, is various kinds of ſwellings.

Encyſted tumors ſeldom lead to this neceſſity; but in ſome inſtances where they are deep ſeated, originating perhaps from the perioſteum, if they are allowed to remain till they acquire a great bulk, all the contiguous parts come to be ſo injured by them, that nothing but the removal of the limb will anſwer any ſalutary purpoſe. In ſome caſes, by a long continued preſſure, the contiguous bones are not only rendered carious, but are altogether diſſolved; at the ſame time that the cellular ſubſtance, and even the

the muſcles of the limb, become ſo much diſeaſed as to give no cauſe to hope that we could be able to ſave them.

We ſometimes find a portion of a limb conſiderably enlarged with an uniform hardneſs in ſome parts, and in others with a degree of ſoftneſs which gives cauſe to ſuſpect that a fluid of ſome kind or other is collected beneath. The ſkin at firſt retains its natural colour; but at laſt it acquires a livid hue. The commencement of the diſeaſe is not attended with pain; but at laſt it not only becomes painful, but extremely troubleſome from its weight. It uſually ariſes without any evident cauſe, and often in people who are otherwiſe healthy: At firſt the ſwelling commonly appears on the inferior part of a limb, and proceeds gradually up till it occupies the whole of it.

Swellings of this kind are at firſt often miſtaken for common œdema or anaſarca; and they ſeem to be ſo far of this nature, that they are evidently produced by

by an effuſion into the cellular ſubſtance: but inſtead of being of the ſerous kind, the effuſed fluid is found to be tinged with blood, and of an acrimonious nature; at leaſt this has been the caſe in all that I have known opened: and it has likewiſe happened, that the matter has never been diſcharged in ſuch quantities as to have much influence on the ſize of the tumors, the ſwelling uſually remaining of nearly the ſame bulk after the operation as before it; Hence no advantage is derived from it. On the contrary, the operation always does harm. A painful ſore is produced; and it always accelerates the progreſs of the tumor. Indeed, nothing I have ever known employed has any effect in retarding it; ſo that I conſider amputation as the only reſource, whenever the tumor has become ſo large as to create any material uneaſineſs. Whether this will always prove effectual or not, I cannot pretend to ſay; but hitherto I have met with no inſtance of the diſeaſe returning where

amputation was performed on a ſound part of the limb.

Swellings of the aneuriſmal kind have alſo been conſidered as a cauſe which, in particular ſituations, may give riſe to amputation. This has originated from the operation for the aneuriſm having failed in different inſtances when performed upon the crural artery, and from the amputation of the limb having in ſimilar affections ſaved the life of the patient. Where an aneuriſm in the ham, or on the thigh, is very large, and has been of ſuch long duration as to hurt the texture of the ſoft parts, as well as to injure the bone, which effuſed blood is apt to do, it will no doubt be better to amputate the limb than to make any attempt to ſave it: But in ſuch a caſe, it is not the aneuriſm for which amputation is adviſed, but a morbid ſtate of the parts, induced by the diſeaſe being allowed to continue too long before any effectual meaſure is adopted for its removal. In the commencement, and for

a conſiderable time thereafter, of the femoral or poplitean aneuriſm, I ſhould never adviſe the amputation of a limb: for different inſtances are on record of limbs being ſaved by the operation for the aneuriſm, even where the artery was injured in the ſuperior part of the thigh: But where ſuch an extenſive oedematous ſwelling is induced all over the under part of the limb, as to leave no room to hope that it could again be reſtored to uſe, even allowing the operation for the aneuriſm to ſucceed, it will no doubt be better to amputate immediately than to attempt the operation.

The aneuriſm we here allude to is that which proceeds from a dilatation of the artery, and in which the coats of the veſſel have burſt, ſo as to produce a conſiderable effuſion of blood into the ſurrounding cellular ſubſtance, probably before any proper aſſiſtance is deſired. This will ſeldom happen but with the pooreſt claſs of people; and therefore this diſeaſe, in the ſtate we are now

ſpeaking of, is chiefly found in hoſpitals. At firſt it is always attended with a good deal of pulſation; but in its later ſtages the ſwelling becomes ſo large that the beating of the artery is ſcarcely, if at all, diſcovered; by which it it apt to be miſtaken for a tumor of a different kind: But for the moſt part, a due attention to the hiſtory of the caſe from the beginning, will lead to a knowledge of its real nature.

The 10th and laſt general cauſe we enumerated, by which amputation may become neeeſſary, is particular diſtortions of a limb.

Where a limb is in other reſpects perfectly ſound, it will ſeldom happen that any diſtortion to which it is liable will be conſidered as a ſufficient reaſon for this operation: But in the courſe of much buſineſs, caſes are ſometimes met with in which limbs are ſo much diſtorted, and are productive of ſo much diſtreſs, that patients rather incline to have them removed than ſubmit longer to the in-

inconvenience. When in ſuch circumſtances we are not able to remove the diſtortion by means of a more gentle nature, we are under the neceſſity of complying with the patient's requeſt.

Theſe are the ſeveral cauſes by which the amputation of a limb may be rendered neceſſary. As they are very various, and as the loſs of a member is to every patient an object of much importance, they merit, in every inſtance, the utmoſt attention from practitioners. Indeed this point of practice, namely, that of fixing with preciſion thoſe caſes in which the amputation of limbs ſhould be adviſed, with the moſt ſuitable periods in each, is attended with ſuch difficulty, and a ſurgeon is ſo apt to be blamed if he proceeds to the operation ſo long as the ſmalleſt doubt remains of the propriety of it, that it ſhould be held as a fixed regulation with every practitioner, never to operate but with the advice of ſome of his brethren in conſultation, when

when this can poſſibly be obtained. We ſhall now proceed to deſcribe the method of operating.

SECTION III.

General Remarks on the Method of Amputating Limbs.

SURGERY is not perhaps in any inſtance brought to greater perfection than in the method of amputating limbs. Before the invention of the tourniquet, this operation was attended with ſo much hazard, that few ſurgeons ventured to perform it: Nay, long after the introduction of this inſtrument, the danger attending it was ſo great, that more than one half periſhed of all who had reſolution to ſubmit to it.

In the preſent improved ſtate of the operation, I do not imagine that one

death will happen in twenty caſes; even including the general run of hoſpital practice: And in private practice, where due attention can be more certainly beſtowed upon the various circumſtances of importance relating to the operation, the proportion of deaths will not be ſo great.

The circumſtances in this operation which more particularly require attention, are, the choice, when this is in our power, of the part at which a limb ſhould be amputated; the prevention of hemorrhagy during the operation; the diviſion of the ſkin, muſcles, and bones, in ſuch a manner as to admit of the ſtump being entirely covered with ſkin; the tying of the arteries alone, without including the nerve or any of the contiguous parts; ſecuring the teguments in a proper ſituation, ſo as to prevent them from retracting after the operation; and a proper ſubſequent treatment of the caſe.

Next to ſecuring the patient from loſs

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of blood, the moſt material of theſe is the ſaving ſuch a proportion of the ſoft parts as will cover the ſtump, ſo as to heal the ſore as nearly as poſſible by the firſt intention: for without this, the wound produced by the removal of a large limb is always extenſive; the cure accordingly proves tedious; and in many caſes the diſcharge proves ſo copious, that the patient's health is irreparably hurt by it. The inconveniences ariſing from this were ſo obvious, that various attempts were made, from time to time, to improve this part of the operation. At firſt, all that was done in amputating a limb, was cutting the ſoft parts down to the bone by one ſtroke of a knife, and afterwards dividing the bone with a ſaw at the edge of the retracted muſcles. It was afterwards propoſed by Mr Cheſelden to divide the ſoft parts by a double inciſion; to divide the ſkin and cellular ſubſtance with a circular inciſion; and then to cut through the muſcles at the edge of the retracted ſkin: by this

means the ſaw was applied higher in the bone, and the ſtump was better covered both with muſcles and ſkin. Still, however, an extenſive ſore was left; inſomuch that in amputations of the thigh, a cure was ſeldom performed in leſs than three or four months; often five or ſix were required; and after all, the ſtumps were commonly pyramidal, by the bone projecting beyond the ſoft parts: It often happened too, that another ſore was produced by this part of the bone exfoliating, long after the patient conſidered himſelf as perfectly well.

To prevent this Pyramidal or Sugar-loaf Stump, as it is termed, a bandage or circular roller was employed, with a view to ſupport the muſcles and teguments, and prevent their retracting; and when properly applied from the upper part of the limb downwards, it in ſome degree anſwered the pupoſe, but never ſo effectually as to prevent the cure from being tedious. In order to ſhorten it farther, it was propoſed by the late Mr Sharpe,

Sharpe, in his Treatiſe on this Operation, to draw the teguments near together by ſtitches or pieces of tape paſſed through them, and tied acroſs the ſtump: But the pain and inconvenience attending this was ſo great, that it never was generally practiſed; and Mr Sharpe himſelf at laſt deſiſted from it.

It was now thought impoſſible to improve this method of operating, ſo as to ſhorten the cure, and in place of a pyramidal, to give the ſtump a plain ſurface. In conſequence of this, about twenty years ago, different ſurgeons attempted to revive the flap operation; which had been firſt practiſed, upwards of a hundred years ago, by an Engliſh ſurgeon of the name of Loudham. It was effected by ſaving a flap of the muſcles and ſkin, in the manner we ſhall afterwards deſcribe, laying it over the ſtump, and ſecuring it in this ſituation by proper bandages till it united to the parts beneath.

As this afforded a thick muſcular cuſhion to the ſtump as well as a complete

covering of ſound ſkin, the higheſt expectations were formed of it: But the objections to it, which we ſhall afterwards mention, were ſo great, that the utmoſt exertions, even of expert ſurgeons, to render it more perfect, have not been able to introduce it to general uſe.

This failure again excited the attention of practitioners to the improvement of the common operation of amputation; and their endeavours have not proved unſucceſsful. By the preſent improved method of operating, ſuch a quantity of teguments is ſaved as completely covers the ſtump; by which, in ſome inſtances, a cure is obtained by the firſt intention without the formation of matter: And in all, unleſs there be ſomething particularly bad in the habit of body, or unleſs the inflammation unexpectedly runs to a very unuſual height, a cure is completed in the courſe of two or three weeks. As I conſider the improvement by which theſe ends are effected as one of the moſt important in modern practice, I hope to be

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excuſed, if I ſhortly ſtate the ſhare I have had in the introduction of it, before proceeding to deſcribe the operation itſelf.

In the courſe of my education, while attending the hoſpital here, as well as the hoſpitals of London and Paris, the inconveniences ariſing from the want of attention to the ſaving of ſkin in different chirurgical operations, ſtruck me ſtrongly; ſo that I was reſolved to take every proper opportunity in my own practice, of treating this point with particular attention.

From the year 1772, when I ſettled in buſineſs, I laid it down as a maxim, not to be deviated from, to ſave as much ſkin and cellular ſubſtance in the removal of tumors, whether cancers or others, when the ſoundneſs of parts admitted of it, as would completely cover the ſores; and in amputating any of the extremities, to ſave as much of them as would entirely cover the ſtumps. I firſt performed amputation in the courſe of that year; and

finding the improvement of ſaving ſkin to anſwer even beyond my expectation, for the cure of a large ſtump in an amputation of the thigh was completed in three weeks, I did not fail of putting it afterwards in practice both in public and private. The practice was likewiſe adopted by my friend Mr Hay, and more lately by ſome other gentlemen in their attendance at the hoſpital; and ever ſince that period, Mr Hay and I have invariably adhered to it, ſome deviations being occaſionally introduced in the mode of doing it, with a view of rendering it more perfect; by which the cures have in every inſtance been greatly ſhortened. In various caſes, large ſtumps, which by the uſual method would have required ſeveral months, were cured in as many weeks: In a few, as was obſerved above, the parts united by the firſt intention: and in all, a plain uniform ſtump was produced.

After this had been practiſed for ſeveral years, Mr Alanſon of Liverpool, in the

the year 1779, publiſhed ſome Obſervations upon Amputation, in which a method of operating is deſcribed, which after nine years experience, he recommends in the warmeſt manner, as anſwering every object to be expected from this operation; and more eſpecially, that of curing the ſtumps in a great meaſure by the firſt intention.

As Mr Alanſon's mode of operating has of late been very deſervedly preferred to every other that was before publiſhed, I ſhall afterwards give an account of it; but in the mean time, I ſhall deſcribe that which I have long been accuſtomed to practiſe, and which after various trials of every other of which I have yet heard, I ſtill continue to prefer. In the firſt place, we ſhall deſcribe the operation as it is performed upon the thigh, and ſhall afterwards ſpeak of the method of amputating in other parts of the extremities.

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SECTION IV.

Of Amputating the Thigh.

IN amputating either the thigh or leg, the patient ſhould be placed upon a table of an ordinary height, with the leg properly ſecured and ſupported by an aſſiſtant ſitting before him. The other leg ſhould likewiſe be ſupported, at the ſame time that the arms ſhould be ſecured by an aſſiſtant on each ſide, to prevent interruptions during the operation.

The flow of blood to the limb ſhould now be ſtopped by the application of the tourniquet, in the manner we have mentioned in the firſt Volume of this Work: and as it is a matter of importance to have the inſtrument placed as near as poſſible to the top of the thigh, the cu-

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PLATE LXXXIV.

FIG. 1.

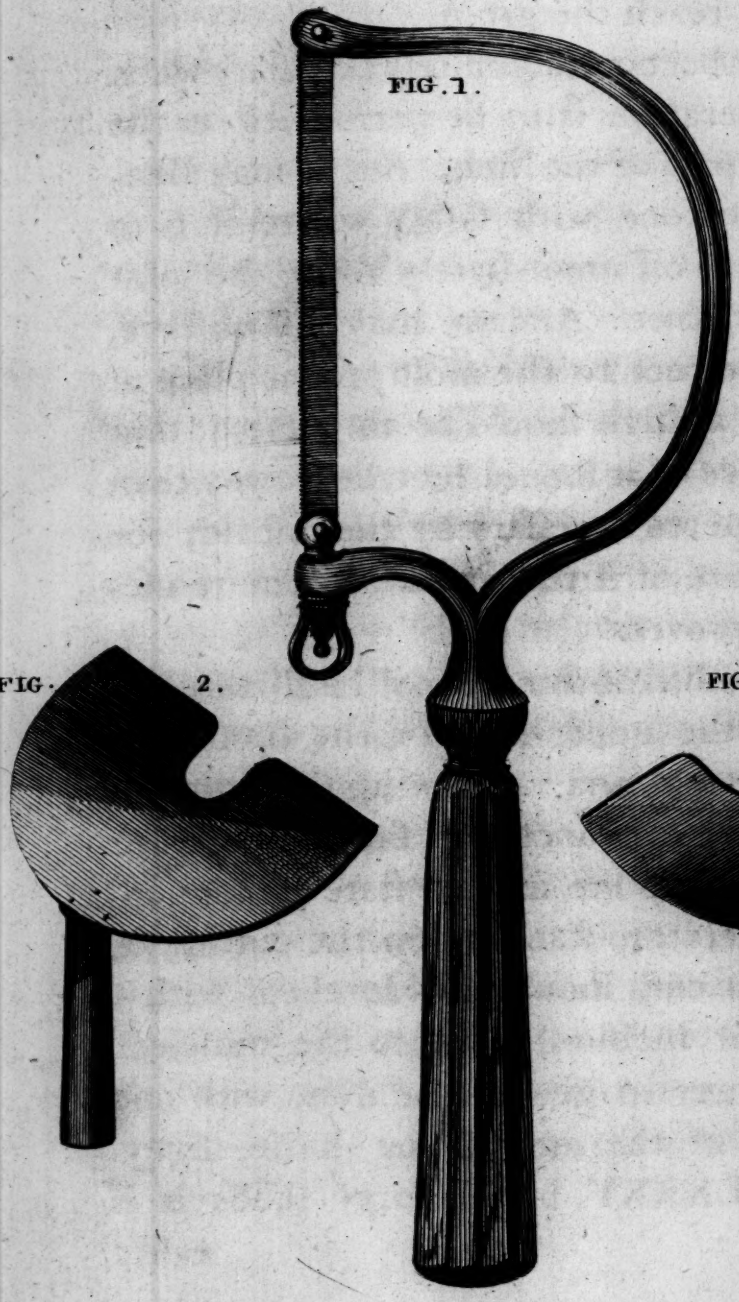


FIG. 2.

FIG. 3.

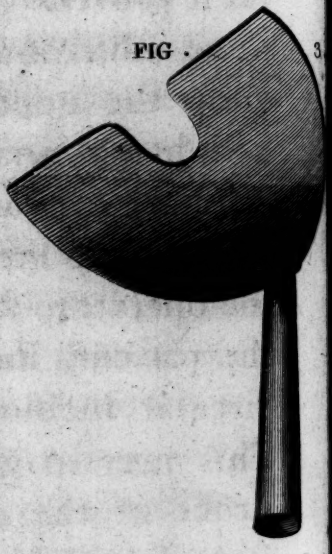
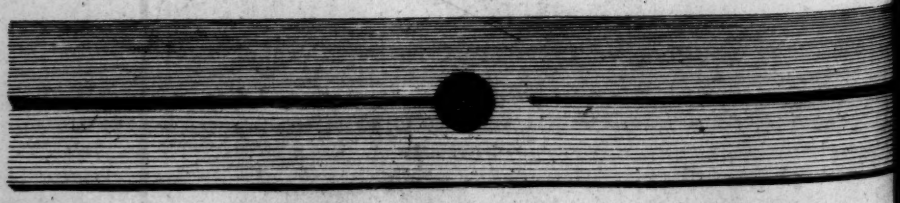


FIG. 4.



ſhion placed upon the femoral artery ſhould reach the groin.

This becomes abſolutely neceſſary when the operation is to be performed on the upper part of the limb: But it may likewiſe be done with ſafety where it is to be taken off immediately above the joint of the knee: And we may juſt obſerve, with reſpect to the moſt proper place at which a thigh ſhould be amputated, that no more of it ſhould be taken away than is rendered neceſſary by the diſeaſe; for the more of it that is left, the more uſeful it proves.

An aſſiſtant ſhould now be directed to graſp the upper part of the limb with both hands, and to draw up the ſkin and cellular ſubſtance as far as poſſible: While they are in this ſtate of tenſion, the operator, ſtanding on the outſide of the patient, ſhould divide them with a circular inciſion down to the muſcles: This may in general be done with one ſtroke of the amputating knife, fig. 3. Plate LXXXV. but in large limbs it is eaſier

eaſier done at twice. The aſſiſtant continuing to draw the teguments upwards, the cellular ſubſtance connecting them to the muſcles beneath, ſhould be divided with the edge of the knife till as much of the ſkin is ſeparated as the operator thinks will cover the ſtump completely.

The ſkin being ſtill drawn tightly upwards, the muſcles ſhould be divided cloſe to the edge of it down to the bone by one perpendicular ſtroke of the knife, beginning with the upper part of the large muſcles on the inſide of the thigh, and continuing the inciſion round through thoſe beneath, and on the outſide till it terminates where it commenced. During this part of the operation, ſome attention is neceſſary to avoid the edge of the retracted ſkin; but it may always be done if the operator be upon his guard, for he may with little difficulty have his eye upon the courſe of the knife from firſt to laſt; nor can this part of the operation be done with ſafety in any other manner:

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PLATE LXXIV.

FIG. 1.

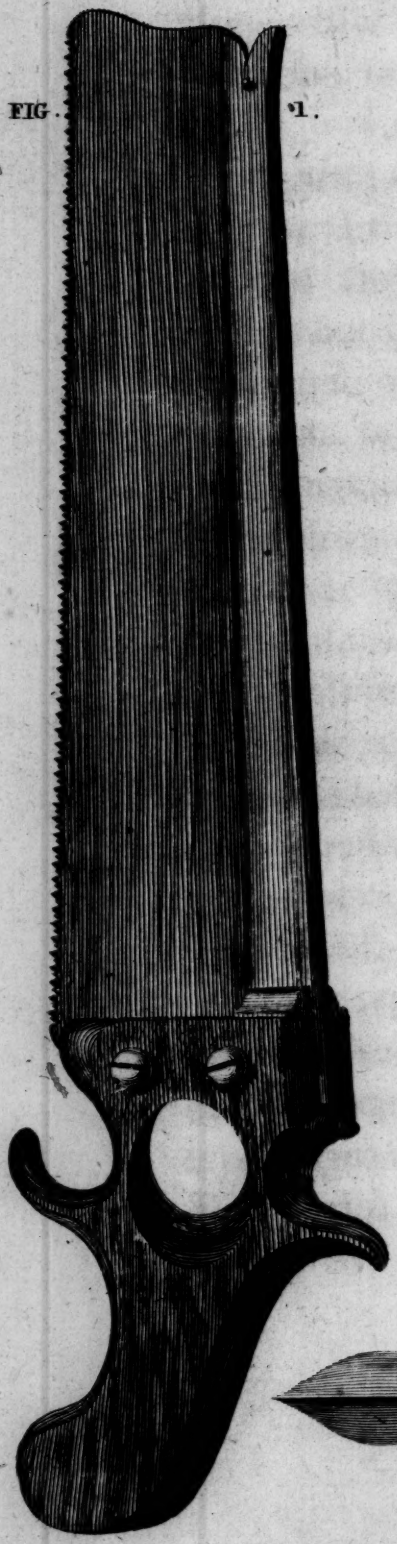


FIG. 2.



FIG. 3.



FIG. 4.



Even where different aſſiſtants are employed to protect the ſkin, it will be apt to be wounded, if the operator does not follow the knife with his eye.

In the uſual method of operating, the bone would now be ſawn acroſs at the edge of the retracted muſcles: but we are more certain of having a good ſtump, if the muſcles be previouſly ſeparated from the bone for the ſpace of an inch; and it is eaſily done by inſerting the point of the common amputating knife between them, and carrying it freely round from one ſide of the limb to the other. This being done, the muſcles and teguments muſt be drawn up as far as the muſcles have been ſeparated from the bone; and it is eaſily done, either with a bit of ſlit leather, ſuch as repreſented in Plate LXXXIV. fig. 4. or with the iron retractors in the ſame Plate, figs. 2. and 3. The perioſteum ſhould now be divided at the place where the ſaw is to be applied, and it ſhould be done with one turn of the knife; for where much of it is ſcraped off,

very

very tedious and troubleſome exfoliations are apt to enſue: The knife ſhould therefore be carried round the bone directly beneath the retractors. At this place the ſaw ſhould be applied, and with long ſteady ſtrokes the bone ſhould be divided. The ſaw repreſented in Plate LXXXV. fig. 1. anſwers much better than the uſual form of the inſtrument with a heavy iron back. In performing this part of the operation, the aſſiſtant holding the leg ſhould be directed to ſupport it with much equality; for if it be raiſed too far, the motion of the ſaw will be impeded, while the bone will be apt to be ſplintered if it be not ſufficiently raiſed. Any points or ſplinters which may be left, ſhould be immediately removed with the nippers, Plate LVI. fig. 2.

The retractors ſhould now be taken off; and the trunk of the femoral artery being drawn out with the tenaculum, a ſufficient ligature ſhould be made upon it before the tour-

tourniquet is looſened: But as the muſcular branches of this artery cannot be diſcovered as long as any compreſſion remains upon them, the ſcrew ſhould be immediately untwiſted ſo far as to remove it entirely. All the clotted blood ſhould be now removed from the ſtump with a ſoft ſponge ſoaked in warm water; and every artery that can be diſcovered ſhould be ſecured with a ligature, care being taken to leave the ends of the threads of a ſufficient length to hang out without the lips of the wound.

The blood-veſſels being all ſecured, and the ſurface of the wound cleared of blood, the muſcles and teguments ſhould be drawn down till the ſkin completely covers the ſtump; and ſhould be retained in this ſituation by an aſſiſtant till a flannel or cotton roller, previouſly fixed round the body to prevent it from ſlipping down, be applied in ſuch a manner as to ſupport and fix them: for which purpoſe it ſhould be paſſed two or three times, nearly in a circular direction, round the

top

top of the thigh; and ſhould afterwards, with ſpiral turns, be brought down near to the end of the ſtump, of ſuch a tightneſs as to prevent the muſcles and ſkin from retracting, without compreſſing them ſo much as to prove painful or to impede the circulation. Here the roller ſhould be fixed with a common pin, while as much of it is left as will paſs two or three times round the ſtump, for a purpoſe to be afterwards mentioned.

The ends of the divided muſcles being placed with as much equality as poſſible over the bone, the edges of the ſkin muſt be laid exactly together, ſo as to form a ſtraight longitudinal line along the centre of the ſtump. When there are only one or two ligatures, they ſhould be left out at the inferior angle of the wound; but when there are ſeveral, they ſhould be divided between the two angles, to prevent the parts from ſuffering by a large extraneous body fixed at any one place.

While an aſſiſtant retains the edges of the divided ſkin in exact contact, two or three ſlips of adheſive plaſter ſhould be laid acroſs the face of the ſtump, to preſerve them nearly in this ſituation; and the whole ſurface of the ſtump ſhould now be covered with a large pledgit of ſoft lint ſpread with Goulard's cerate, or the common calamine cerate of the Diſpenſatories: Over this there ſhould be placed a ſoft cuſhion of fine tow with a compreſs of old linen: For the purpoſe of retaining them, as well as with the view of making a gentle preſſure upon the ſtump, a ſlip of linen, of three inches in breadth, ſhould be laid over them; and ſhould run directly acroſs, and not from above downwards. On being properly placed, the remaining part of the roller ſhould be employed to fix it, by paſſing it two or three times round the ſtump; and the preſſure formed by the croſs ſtrap may afterwards be increaſed or diminiſhed at pleaſure, by drawing

it with more or leſs tightneſs, and fixing it with pins to the circular roller.

While we apply the roller the tourniquet ſhould be removed, and replaced immediately when the ſtump is dreſſed. If left looſe it gives no uneaſineſs; and it enables the attendants to check any hemorrhagy which may happen: a circumſtance which merits attention for ſeveral days after amputation of any of the extremities.

The patient ſhould now be carried to bed; but inſtead of raiſing the ſtump to a conſiderable height with pillows, as is uſually done, it ſhould be laid ſomewhat lower than the reſt of the body: for this purpoſe, the bed ſhould be made with a gentle declivity from above downwards, and nothing ſhould be put beneath the ſtump but a little fine tow.

To prevent the patient from moving the limb inadvertently, as well as to guard in ſome meaſure againſt the effect of thoſe ſpaſms which often prove

troubleſome after this operation, I commonly employ two ſlips of linen or flannel to fix the ſtump down to the bed. It is eaſily done, by laying one acroſs near the extremity of the ſtump, and another near to the root of the thigh. They ſhould be pinned to the circular roller round the limb; and the ends of each of them ſhould be pinned to the bed: or they may be tied to it by pieces of ſmall tape previouſly ſewed to the bed or to the matraſs; which anſwers better than a feather bed for any patient that is to be long confined. A baſket or hooped frame ſhould now be put over the ſtump, to protect it from the bed-clothes; and whether the patient complains much or not, I make it a conſtant rule to give him an anodyne, by which he remains quiet and perfectly eaſy through the remainder of the day, inſtead of being reſtleſs and diſtreſſed, which he is otherwiſe apt to be.

As hemorrhagies will ſometimes happen, even many hours after the opera-

tion, the attendant who takes the charge of the patient ſhould be ſtrictly enjoined to examine the ſtump frequently with the utmoſt care; and on any quantity of blood breaking out, to twiſt the tourniquet ſufficiently tight to put a ſtop to it, till aſſiſtance is procured. I think it right, however, to obſerve, that in general it is the fault of the practitioner when this very perplexing occurrence takes place; for it ſeldom happens when the arteries are ſearched for in the time of the operation with that accuracy which the importance of the caſe requires. Indeed hemorrhagies are leſs frequent after this method of operating than when the muſcles are left uncovered; and this is one material advantage that reſults from it: for however attentive a ſurgeon may be in ſecuring the arteries, the irritation produced upon an extenſive wound, and the ſpaſms which enſue, very frequently terminate in fatal hemorrhagies. Of this I have known ſeveral inſtances; while no diſcharge

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of any importance has ever happened in the method of operating we are now deſcribing. I believe too, as I have elſewhere remarked, that ſome additional ſecurity is derived from the uſe of the tenaculum: for although thoſe who have not been in the habit of uſing it, are apt to conſider it as more uncertain than the needle, yet it is far from being ſo. I will not ſay that hemorrhagies will never enſue where the tenaculum is employed; but it has ſo happened in the courſe of my obſervation, that the needle was uſed in every caſe of hemorrhagy that proved fatal.

Where there is only a trivial oozing of blood we need not be alarmed; nor will it be neceſſary to remove the dreſſings: But whenever the diſcharge is ſo conſiderable as to give cauſe to ſuſpect that it proceeds from a large artery, nothing but the ſecuring it with a ligature can be depended on. This being done, the dreſſings muſt be renewed in the ſame manner as at firſt.

The only other ſymptoms we have reaſon to dread, during the firſt three or four days after the operation, are thoſe ſpaſmodic affections of the muſcles which we have alluded to above, and the inflammation and tenſion of the ſtump, with the conſequent fever which in ſome degree ſucceed to every caſe of amputation, but which always prove hazardous when they proceed to any great height.

When the arteries are tied without including the nerves, or any part of the contiguous muſcles, theſe ſpaſms ſeldom become troubleſome: But when they do take place, if laying the limb in as eaſy a relaxed ſtate as poſſible does not render them moderate, we muſt truſt to opiates for their removal.

For the prevention of inflammation, the patient muſt be confined to as low a regimen as the ſtate of his ſtrength will permit. In weak emaciated habits this muſt be managed with much diſcretion, as the conſtitution might be materially hurt by too low a diet: but where there

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is much plethora, with a tenſe fibre, together with a ſtrict antiphlogiſtic regimen, the patient ſhould be blooded as ſoon as quickneſs and fulneſs of pulſe or other ſymptoms of fever take place; he ſhould take plentifully of diluent drink; and his bowels ſhould be kept open with any of the cooling neutral ſalts.

It is proper, however, to obſerve, that it is during the firſt days only after the operation that remedies of this kind are in general neceſſary. When the inflammatory ſtage is over, evacuations of every kind are to be dreaded; even laxatives are apt to do miſchief if they are ever carried farther than is juſt neceſſary for preſerving a regular ſtate of the bowels.

At the end of the third day, whatever the previous ſymptoms may have been, the ſtump ſhould be examined. Where a free ſuppuration is expected, as always happens when the ſtump is not covered with ſkin, the parts ſhould not be looked at till the fourth or fifth day: but here

there is no reaſon for this delay; and the patient is always rendered more eaſy and comfortable by the removal of the firſt dreſſings. For this purpoſe the ſtump ſhould be gently ſupported by an aſſiſtant, till the laſt turns of the roller are undone, and till the croſs ſlips, tow, and even the large pledgit of ointment next the ſore, are removed. In a few caſes the parts will be found to be united by the firſt intention; but for the moſt part it will be otherwiſe: There will be a ſmall quantity of matter over the ſurface of the ſtump, chiefly at the inferior angle of the wound; and the parts will be red, tenſe, and painful to the touch, with a ſmall ſeparation or opening between the edges of the divided ſkin, notwithſtanding the plaſters employed to retain them. As in this ſtate the plaſters will do no ſervice, they ſhould likewiſe be removed; and it is eaſily done when they are thus moiſtened with matter. The ſurface of the ſtump ſhould now be covered with a pledgit of

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the ſame ointment as at firſt; and a cuſhion of ſoft tow being laid over it, the croſs ſlips of linen and circular roller ſhould be again employed; but with no more preſſure than is merely neceſſary for ſupporting them.

In this manner the dreſſings ſhould be renewed every ſecond day; when, by the ſeventh or eighth day, the inflammation and tenſion will in general be ſo far diminiſhed as to admit of the ligatures on the arteries being eaſily removed; at leaſt they may now be gently pulled daily, and for the moſt part they will yield on the ſecond or third trial: when allowed to remain longer, they not only prevent the wound from healing, but are apt to be more difficult to remove afterwards.

As long as the roller is preſerved clean, it may be allowed to remain; but as ſoon as it becomes ſullied with matter, it ſhould be removed and another applied in its place; nor ſhould it be entirely laid aſide till the third or fourth week

from the operation. After this period, however, it ſhould be removed, as when longer continued it is apt to render the limb ſmaller than the other.

As ſoon as the ſore is obſerved to be perfectly clean, with granulations ſprouting up in different parts of it, as the pain and tenſion will now be quite removed, we may with ſafety venture to complete the cure, by drawing the edges of the wound together by adheſive plaſters. In this ſtate of the ſore no harm ever enſues from it, and it ſhortens the cure conſiderably.

By this management, even the largeſt ſtumps will for the moſt part be healed in three or four weeks; often in leſs. But it muſt be remarked, that although we may in general depend on this in private practice, where every circumſtance that can conduce to the welfare of the patient will meet with attention, and where eſpecially we may always obtain a well-ventilated apartment and proper diet; yet in public hoſpitals,

hoſpitals, where theſe points cannot be duly attended to, and where the patient often ſuffers more from the bad air which he breaths, than from the operation itſelf, the ſucceſs attending it will not in every caſe be ſo great. Inſtead of the teguments adhering readily to the parts beneath, large quantities of matter ſometimes form between them, which always renders the cure more tedious, and which in ſome caſes cannot be accompliſhed but by ſending the patient to a more free air, and by a more plentiful allowance of wine and other cordials than can in general be obtained in hoſpitals. But for one inſtance of this kind, in the operation we have deſcribed, I may with ſafety affirm, that twenty will occur in the uſual mode of conducting it: In the former, thoſe obſtacles to a cure do not commonly occur; in the latter, they are often obſerved.

When ſpeaking of the time in which ſtumps may be expected to heal, I think it right to obſerve, that it ſhould not be

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our object to accompliſh a cure in the firſt inſtance without the formation of matter: It commonly anſwers better when effected in the more gradual manner we have pointed out. When a ſtump heals ſuddenly, and the edges of the divided ſkin adhere by the firſt intention, the teguments are apt to be puckered and uneven, and the ligatures of the arteries are removed with difficulty. Of this I have had different caſes, when ſuch ſtrong adheſive plaſters were made uſe of as kept the edges of the ſkin in cloſe contact: But when the common court-plaſter is made uſe of, or any other compoſition poſſeſſed of the ſame degree of adheſive property, although the teguments will be prevented from ſeparating to any conſiderable extent, yet they will readily yield to the retraction which uſually takes place on the acceſſion of tenſion and pain. In this manner, a ſlight ſeparation is uſually produced; by means of which the ligatures are eaſily taken out; any matter that may form is readily diſcharged;

charged; the corners left above and beneath, by the teguments being drawn together, are much leſſened; and the ſtump is always left ſmooth and equal: Hence thoſe ſtumps which take three weeks or perhaps a month to heal, are uſually better than thoſe which heal much ſooner. The advantages attending a ſpeedy cure, and the covering the ſtump with ſkin, are ſo great, that they need not be enumerated; but I thought it right to mention the inconveniences which occur from our endeavouring to haſten the union of the divided ſkin too quickly, either by adheſive plaſters, or ſutures, which laſt has in ſome caſes been attempted.

It will be readily perceived, that the principal difference between this operation and the uſual method of amputating, conſiſts in the ſaving of as much of the muſcular ſubſtance of the limb as will completely cover the bone, together with as much ſkin as will cover the whole ſurface of the ſtump: But it is proper to remark, that we may err in

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ſaving more of each of theſe parts than is requiſite, and that ſome attention is therefore neceſſary to guard againſt it. In leaving too much muſcular ſubſtance, we muſt neceſſarily ſhorten the limb too much, by ſawing the bone higher than we otherwiſe would do; and by ſaving too much ſkin, we render the ſurface of the ſtump puckered and uneven.

With reſpect to the quantity of muſcular ſubſtance that ſhould be ſaved, I have hitherto found, that the directions given above, in general, anſwer the purpoſe. By ſeparating the muſcles from the bone for the ſpace of an inch, and ſawing it at this height, above where it is divided in the ordinary method of amputating, the bone will always be ſufficiently covered with fleſh; and a very little experience enables us to judge of the quantity of ſkin that ſhould be ſaved for covering the ſtump: But even when more is ſaved than is altogether neceſſary for this purpoſe, a little attention will enable us to prevent inequalities. By

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an aſſiſtant drawing down the teguments, in the manner we have directed, before the roller is applied, as much of them may be pulled down as is juſt neceſſary; and if they are preſerved in this ſituation till the application of the roller is finiſhed, any inconveniency which might have occurred from too great a quantity will be prevented.

It will likewiſe be obſerved, that in making the firſt inciſion of the teguments, I have not deſired a circular piece of tape to be made uſe of, as is uſually done, to ſerve as a direction for the knife. This deviation from the common practice has been long adopted by ſome individuals; but ſo far as I know, it was firſt ſuggeſted by the late Doctor Hunter of London; and I think it a material improvement of this part of the operation: for beſides the ſaving of time, which is always of importance in that ſtate of anxiety to which a patient is reduced who is placed upon a table for the purpoſe of loſing a limb, it in reality puts it in our power

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to make the inciſion with more neatneſs, more ſpeedily, and with leſs embarraſſment, than when the tape is employed. Thoſe who have been accuſtomed to the tape will at firſt be of a different opinion; but whoever will lay it aſide, will find, that the circular inciſion may be made with more exactneſs merely by following the knife with the eye; and I am certain that it may be done in one half of the time. When the tape is employed, a good deal of time is loſt in endeavouring to keep the knife exactly in a line with it; and if it be not applied with the utmoſt exactneſs, it neceſſarily renders the inciſion ragged and unequal; an occurrence I have obſerved in different inſtances, even with expert ſurgeons, while I never perceived any inequality where the tape was not uſed.

It has been objected to the operation now deſcribed, that being more tedious than the uſual method of amputating, it muſt neceſſarily create more pain. The difference in this reſpect, however, muſt be

be trifling; for it muſt be remembered, that the inciſion of the ſkin, which is the moſt painful part in every operation, is the ſame in both. The diviſion of the cellular ſubſtance is quickly performed, and little or no pain enſues from it: And the third inciſion, if we may ſo term it, or the ſeparation of the muſcles from the bone, may be performed in the tenth part of a minute. In different inſtances I made uſe of a ſcalpel for ſeparating the cellular ſubſtance from the muſcles beneath, as well as for ſeparating the muſcles from the bone; but I now find that both theſe parts of the operation may be done with the common amputating knife with equal eaſe and expedition: and we ſhould avoid multiplying inſtruments, wherever the intention can be anſwered equally well with a ſmaller number. The knife delineated in Plate LXXXV. fig. 3. is the one I now prefer, after trying various forms of it: It is of a middling ſize, ſomewhat ſhorter than the one in common uſe, and perfectly ſtraight. The curved

knife is ſtill uſed by ſome practitioners, but I have never heard any good reaſon given for it.

If any ſurgeon ſhould find it difficult to ſeparate the muſcles from the bone with this knife, the inſtrument recommended by Mr Gooch, and delineated in Plate LXXXV. fig. 4. may be employed.

I ſhall now deſcribe ſuch parts of Mr Alanſon's method of performing this operation as are peculiar to himſelf; and in order to convey the meaning of the author with exactneſs, I ſhall give it in his own words from the ſecond and laſt edition of his book, page fifty-firſt.

"Apply the tourniquet in the uſual way; ſtand on the outſide of the thigh; and let an aſſiſtant draw up the ſkin and muſcles, by firmly graſping the limb circularly with both hands. The operator then makes the circular inciſion as quickly as poſſible through the ſkin and membrana adipoſa down to the muſcles: He next ſeparates the cellular and membranous attachments with the edge of his knife,

knife, till as much ſkin is drawn back as will afterwards, conjointly with the following diviſion of the muſcles, cover the ſurface of the wound with the moſt perfect eaſe.

"The aſſiſtant ſtill firmly ſupporting the parts as before, apply the *edge* of your knife upon the inner edge of the muſculus vaſtus internus, and at one ſtroke cut obliquely through the muſcles upwards as to the limb and down to the bone; or, in other words, cut in ſuch a direction as to lay the bone bare about two or three fingers breadth higher than is uſually done by the common perpendicular circular inciſion: now draw the knife towards you, ſo that its point may reſt upon the bone, ſtill attending to keep it in the ſame oblique line, that the muſcles may be divided all round the limb in that direction by a proper turn of the knife; during which its point is kept in contact with, and revolves round, the bone.

"The part where the bone is to be laid bare, whether two, three, or four fingers breadth higher than the edge of the retracted integuments; or, in other words, the quantity of muſcular ſubſtance to be taken out in making the double inciſion, muſt be regulated by conſidering the length of the limb, and the quantity of ſkin that has been previouſly ſaved by dividing the membranous attachments.

"The quantity of ſkin ſaved, and muſcular ſubſtance taken out, muſt be in ſuch an exact proportion to each other, as that by a removal of both the whole ſurface of the wound will afterwards be eaſily covered, and the length of the limb not more ſhortened than is neceſſary to obtain this end. However, it is to be obſerved, that the more muſcular ſubſtance we ſave, by fully giving the oblique direction to the knife, inſtead of dividing the membranous attachments, the better."

Mr Alanſon now gives ſome directions for the uſe of the retractor; for ſecuring the

divided arteries with ligatures; and for the application of the flannel roller: Afterwards he proceeds thus.—"You are now to place the ſkin and muſcles over the bone in ſuch a direction as that the wound ſhall appear only in a line with the angles at each ſide; from which points the ligatures are to be left out, as their vicinity to either angle directs: The ſkin is eaſily ſecured in this poſture by long ſlips of linen or lint, about two fingers in breadth, ſpread with cerate or any other ointment: if the ſkin do not eaſily meet, it is beſt brought into contact by ſlips of linen ſpread with ſticking plaſter. Theſe are to be applied from below upwards acroſs the face of the ſtump, and over them a ſoft tow pledgit and compreſs of linen, the whole to be retained by the many-tailed bandage, with two tails or ſlips to come from below upwards to retain the dreſſings upon the face of the ſtump."

Mr Alanſon uſes a knife with a double edge, which he thinks preferable to the one commonly employed.

As I wiſh the author's ideas to be clearly underſtood, I think it right to add, that in page 17. he directs the bone to be laid bare three or four fingers breadth higher than is uſually done by the common perpendicular inciſion of the muſcles: That is, that by the oblique direction of the knife three or four fingers breadth of muſcular ſubſtance ſhould be ſcooped out. And in page 21. he obſerves, that "a ſtump formed in the thigh, agreeably to the foregoing plan, if you bring the parts gently forwards after the operation, and then view the ſurface of the wound, may in ſome degree be ſaid to reſemble a conical cavity, the apex of which is the extremity of the bone:" and the parts thus divided, he obſerves, are obviouſly the beſt calculated to prevent a ſugarloaf ſtump.

From what has been ſaid, it will appear, that Mr Allanſon's method of operating differs chiefly from that which I have adviſed above, in the manner of dividing

dividing the muſcles and in the after poſition of the ſkin. Every ſurgeon is apt to be partial to that mode of operating which he has been accuſtomed to practiſe; but being always anxious to have this very important operation improved to the higheſt poſſible degree, I was reſolved to give Mr Allanſon's method a fair trial, being hopeful from the accounts received of it, that I ſhould find it anſwer better even than that which I have ſpoke ſo highly of. I can with truth however aſſert, that it did not anſwer my expectation. The ſtumps formed by it are indeed much better than can be made by the uſual method of amputating; but the removal of ſuch a large portion of muſcular ſubſtance, as is done by Mr Alanſon's oblique inciſion, produces a hollow, which not only retains the matter, but which prevents the ſtump from being ſo ſmooth and equal as when the ſkin is ſupported by a flat muſcular ſurface in the manner we have adviſed. Mr Alanſon, who is in the daily practice of it, may be able to

obviate theſe difficulties; but I know that I cannot make ſuch a good ſtump in this manner as I always do in the other method of operating; nor is Mr Alanſon's own idea ſo completely anſwered by his method of operating. He very properly obſerves, page 63. that in the thigh we want a ſufficient cuſhion between the bone and machine to be uſed in walking; that the more muſcular ſubſtance that is ſaved, the farther will the point of bone on which the preſſure principally produces inconvenience, be removed from the ſurface of the machine; and likewiſe, that a more vigorous circulation will be kept up all round the extremity of the bone and ſtump, which leſſens the danger of exfoliation. Now it is obvious, that the endof the bone will not be ſo much covered with muſcular ſubſtance when a conſiderable portion of the muſcles is removed by the oblique inciſion as when they are allowed to remain; nor will the circulation be ſo vigorous round the end of the bone.

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But admitting Mr Alanſon's method of operating to be in every point equal to the other, the greater difficulty of performing it is a weighty objection to it. Indeed few, I believe, will be able to divide the muſcles by the oblique inciſion without mangling the ſkin, even with the explanation given by Mr Alanſon in the laſt edition of his book. Accordingly we find, in page 204. that this actually happened in the hands of an expert ſurgeon, Mr Lucas of Leeds, even where the diviſion of the muſcles was not begun cloſe under the retracted integuments, but a little lower. Nor will this be an uncommon occurrence, if the muſcles are divided with the edge of the knife, as is directed by Mr Alanſon. I have divided them with the point of the knife, but with difficulty; for the point cannot be eaſily carried round to the height of three or four fingers breadth above the retracted ſkin, ſo as to make a ſmooth equal cut. I do not ſee how the edge of the knife can be applied to cut ſo obliquely upwards

wards without hurting the ſkin; and yet Mr Alanſon's words are, "apply the edge of your knife, and at one ſtroke cut obliquely thro' the muſcles," &c. He deſires indeed, that the inciſion may be finiſhed with the point; but I do not underſtand how it can be done without cutting the ſkin, if the point be not employed from firſt to laſt. Indeed Mr Alanſon himſelf admits that there is difficulty in this part of the operation; for in page 18. he ſays, "that while one aſſiſtant continues a firm and ſteady elevation of the parts, another ſhould attend to preſerve the ſkin from being wounded as the knife goes through the muſcles at the under part of the limb." This of itſelf appears to be a material objection to this method of operating: For two aſſiſtants, whoſe hands are all employed nearly at one point, muſt be apt to embarraſs not only each other but the operator: And beſides, it muſt often happen that two aſſiſtants cannot be procured.

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With reſpect to the line of direction in which the wound ſhould be cloſed, Mr Alanſon obſerves, page 67, if it be formed from above downwards, the cicatrix will generally be found directly oppoſite to the bone; by which, in walking with an artificial leg, the point of preſſure muſt be upon the new-formed ſkin; which he thinks will be avoided by forming the line in the contrary direction from ſide to ſide: in which caſe, after the cure is complete, it will be found, that in conſequence of the more powerful action of the flexor muſcles, the cicatrix is drawn downwards, and the extremity of the bone is therefore covered with the old ſkin; by which the greateſt preſſure falls upon this part, and not upon the new formed ſkin.

I have not found, however, that this argument is of much importance: for this retraction of the flexor muſcles which Mr Alanſon alludes to is in a great meaſure owing to the cuſtom of elevating the ſtump after the operation, and

may be prevented by keeping it lower than the reſt of the body in the manner we have mentioned. And beſides, the bone is ſo well covered with muſcular ſubſtance, and the cicatrix is ſo narrow when the operation is rightly done, that I have not met with a ſingle inſtance of any inconveniency ariſing from this circumſtance mentioned by Mr Alanſon: whereas, the lodgement of matter proves always ſo troubleſome and pernicious, and would in all probability occur ſo frequently, were the practice generally adopted of making a tranſverſe opening inſtead of a longitudinal one upon the face of the ſtump, that this appears to be a ſufficient reaſon for preferring the former.

With a view to prevent that inequality on the ſurface of the ſtump, which ariſes from the retraction of the flexor muſcles of the thigh, I have in ſome caſes divided theſe muſcles an inch lower than thoſe of the reſt of the limb. After dividing the ſkin and cellular ſubſtance with a cir-

circular inciſion in the uſual way, this is eaſily done; and it prevents this inconvenience effectually: but it is not neceſſary when the ſtump is treated in the manner we have mentioned.

Whether others may deem theſe obſervations upon Mr Alanſon's method of amputating important or not, I cannot determine; but as they appeared to me to be of conſequence, I thought it my duty to offer them.

It is but juſtice, however, to remark, that the public is much indebted to Mr Alanſon for his aſſiduity in endeavouring to improve this very important operation, and for the many uſeful practical remarks contained in his publication.

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SECTION V.

Of Amputating the Leg.

IN amputating the thigh we obſerved, that as much of the limb ſhould be ſaved as can be done with propriety; for the longer the ſtump the more utility is derived from it: But in the amputation of the leg, it has hitherto been almoſt a general rule to take it off a little below the knee, even where the diſeaſe for which it is adviſed is ſeated on or near the ancle, and where accordingly the operation might be performed much lower. The reaſon given for this is, that a few inches of the leg being ſaved anſwers as a ſufficient reſt to the body in walking when the limb is inſerted into the box of a wooden leg; and when much more of it is left, that it proves troubleſome

ſome both in walking and ſitting, without being attended with any particular advantage.

Were we to conclude, that the common practice of bending the joint of the knee and reſting upon the anterior part of the leg was neceſſary, this method of operating a little below the knee would be admitted as the beſt: But as we have now had many inſtances of patients walking equally well with machines ſo contrived as to admit of the uſe of the knee-joint; as theſe machines, by reſembling the human leg, are much more pleaſing to the eye than the wooden ones in common uſe; and as the operation may be done with much more eaſe and ſafety to the patient a little above the ankle, I am of opinion that it ſhould always be adviſed to be done here whenever it is practicable, inſtead of the ordinary place a little below the knee.

The operation is eaſier done a little above the ancle than at the upper part of the leg, by the parts to be divided being

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leſs extenſive: for the diameter of the leg is here conſiderably leſs; and it is done with more ſafety by our being able to cover the bone more completely with ſoft parts, ſo as to accompliſh a cure in the ſame manner and equally ſoon as in the thigh: Whereas, immediately below the knee, the bones are not only larger, but there is ſuch a ſcarcity of ſoft parts, that the cure proves always much more tedious, notwithſtanding all our endeavours to promote it; inſomuch, that in operating at the uſual place, about four inches beneath the patella, the ſore, with all the attention we can give to it, will ſeldom heal in leſs than ten or twelve weeks; and in the common method of forming the double inciſion, it will even require four or five months: Whereas, when the operation is rightly performed a few inches above the ankle, a cure may for the moſt part be effected in a fortnight or three weeks.

It is true that a method of amputating beneath the knee has been propoſed, by what

what is termed the Flap Operation, and by which a cure may be more ſpeedily effected than in the uſual way of operating; but ſtill it is tedious, and at the ſame time is liable to other objections, which we ſhall have preſently occaſion to mention. I therefore conclude, that in every caſe that admits of it, amputating a little above the ankle is preferable to operating immediately below the knee.

We are next to determine the moſt proper place for the operation, when we are prevented by the extent of the diſeaſe in the leg from amputating lower than the uſual place beneath the knee. Where the upper part of the leg is ſound, it has hitherto been a fixed maxim to amputate below the joint of the knee rather than above it.

While practitioners were unacquainted with the preſent improvements in the operation of amputation, they ſeem to have adopted this maxim, chiefly from finding that the body reſted more eaſily

upon the ſound ſkin on the fore-part of the leg than on the ſtump of the thigh: But now that the operation may be done above the knee, ſo as that the ſore will heal in leſs than one half of the time that is required when a leg is taken off immediately below the joint, and in ſuch a manner that the ſtump is covered with ſound ſkin, as well as with ſome muſcular ſubſtance, which admits of the patient reſting upon it with freedom; this reaſon, upon which the practice is chiefly founded, falls to the ground.

We have obſerved above, that the cure of a ſtump immediately below the knee is always tedious, owing to the great extent of bone at this part, and the natural deficiency of ſoft parts.

Upon the whole, therefore, I conclude, that amputation immediately below the knee ſhould ſeldom or never be adviſed: But as no innovation will at firſt be generally admitted, I think it right to deſcribe the method of operating when

when it is determined to amputate at this part.

The patient ſhould be placed upon a table, and ſecured in the ſame manner as in operating above the knee. The tourniquet ſhould be applied a little above the knee, with the cuſhion upon the artery in the ham. The foot and leg ſhould be ſecured by an aſſiſtant ſitting before the patient, while the teguments are drawn up by another aſſiſtant towards the knee. The ſurgeon, ſtanding on the inſide of the leg, ſhould now with the knife, Plate LXXXV. fig. 3. make a circular cut through the ſkin and cellular ſubſtance down to the muſcles, ſo far down upon the limb, that when as much of the teguments are ſeparated from the parts beneath as will cover the ſtump, the muſcles and bones may be divided immediately below where the flexor tendons of the leg are inſerted. The interoſſeous ſoft parts muſt be divided either with the point of the amputating knife or with the catline, Plate

LXXXV. fig. 2. The retractors, Plate LXXXIV. figs. 2. and 3. muſt now be applied ſo as to ſupport and protect the ſkin and other ſoft parts from the ſaw employed for dividing the bones. This being done, and the veſſels ſecured, the teguments ſhould be drawn over the ſtump and retained with adheſive plaſters, in the manner we have adviſed in amputating the thigh. The practice, indeed, ſhould be the ſame during the whole courſe of the cure; only, in the application of the flannel roller, there is no neceſſity for beginning at the top of the thigh: It ſhould receive, however, two or three turns above the knee, to prevent it from ſlipping down.

In ſeparating the adheſions of the ſkin from the parts beneath, as much of the cellular ſubſtance ſhould be taken along with it as can be got; otherwiſe the circulation in the ſkin itſelf is apt to become ſo languid as to prevent it from adhering to the parts on which it is applied. It will be found too, that more attention is neceſſary to deſtroy the attach-

tachments of the ſkin in this ſituation, particularly on the fore-part of the leg, than on the thigh, owing to the cellular ſubſtance being more condenſed where it lies ſo contiguous to the bone, than in the thigh, where the muſcles intervene. And as this ſtate of the cellular membrane prevents the teguments from retracting freely after they are divided; and as they cannot even be pulled ſufficiently up by the aſſiſtant, it is neceſſary to fold ſuch of them as are ſeparated from the parts beneath back upon the ſound ſkin, before the diviſion of the muſcles be attempted; otherwiſe the ſkin will either be cut with the knife, or the muſcles will not be divided ſo high as is neceſſary.

Always at this part of the leg, and in a few caſes immediately above the ankle, I have found it neceſſary to fold the ſkin back in this manner; but hitherto no inſtance has occurred in the thigh, but where the operation might have been done merely by pulling the teguments

up, in the manner we have formerly mentioned.

We have deſired above, that in this operation the ſurgeon ſhould ſtand on the inſide of the leg: By this means, if the knee and foot be turned inwards, ſo as to raiſe the fibula, the ſaw may be applied in ſuch a manner to both bones as to divide them nearly together; which is the ſureſt method of preventing them from breaking when they are nearly ſawn through: Whereas, on ſtanding on the outſide of the patient, the fibula will be more apt to be left to the laſt; at the ſame time that the ſaw will be applied upon the ridge of the tibia ſo as to act upon its longeſt diameter, by which it will not be ſo quickly divided.

In operating above the ankle, that ſpot ſhould be fixed upon which will leave the ſtump of the moſt convenient length for being fitted with a leather machine reſembling the other leg. And I find from obſervation, as well as from the information of Mr Wilſon, an ingenious tradeſman

tradeſman of this place, that nine inches from the joint of the knee is the beſt length for this purpoſe; for it affords a ſufficient ſupport to the machine, and at the ſame time prevents it from being ſo heavy and clumſy as when the leg is left of a greater length: for when taken off immediately above the ankle, the ſtump muſt go down to the very bottom of the machine, which muſt therefore be made thicker and heavier at the ankle than would otherwiſe be required; at the ſame time that it will prevent it from correſponding ſo exactly as it otherwiſe would do to the ſize of the other leg.

In addition to what we have ſaid upon the method of amputating the leg immediately below the knee, we may obſerve, that in operating above the ankle, it ſhould be done exactly as we have adviſed in deſcribing the Amputation of the Thigh: Only in this ſituation, inſtead of muſcles, we find a portion of both bones covered merely with ſkin and cellular ſubſtance; but as the cellular

membrane is here commonly ſufficiently lax, and in greater quantity than in the upper part of the leg, it is not only more eaſily ſeparated from the perioſteum, but ſerves to give the bones a more complete covering: By which, when the operation is properly done, the cure for the moſt part is accompliſhed in leſs than three weeks, and the ſurface of the ſtump is equal and every where covered with ſound ſkin.

SECTION VI.

Of Amputating with a Flap.

IN performing the operation of amputation in the uſual way, the cures were ſo extremely tedious; the health of the patients was thereby ſo much injured; and the ſtumps, when healed, were ſo pyramidal, and ſo thinly covered with

ſoft

ſoft parts, that, another method of operating, as we have obſerved above, was propoſed upwards of a hundred years ago; in which an attempt was made to obviate theſe difficulties, by preſerving a flap of muſcles and ſkin for the purpoſe of covering the ſtump.

This was firſt propoſed by one Loudham, a Britiſh ſurgeon: It was afterwards practiſed in Holland, Germany, Switzerland, and France; and more lately by ſome individuals in Britain and Ireland; but it has never been received into general uſe, nor is it probable that it will ever be frequently performed.

The chief objections to it were, the difficulty of reſtraining the hemorrhagy when it happened to recur after the flap was applied and fixed in its ſituation by ſutures; for in order to diſcover the bleeding arteries, it was neceſſary to undo the whole; the flap not adhering uniformly over the whole ſurface of the ſtump; and the pain, inflammation, and tenſion, which ſupervened, being much more

more ſevere than after the uſual method of operating.

To remove theſe difficulties, it was propoſed, about twenty years ago, by Mr O'Halloran, an ingenious ſurgeon of Limerick, to dreſs the ſtump and flap as ſeparate ſores for the firſt twelve days; when the riſk of hemorrhagy being over, the ſymptoms of pain, inflammation, and tenſion, ſubſided, and ſuppuration eſtabliſhed, we are directed to turn the flap back upon the ſurface of the ſtump, and by means of plaſters, compreſſion, and bandage, to ſecure it in this ſituation till they unite together.

By this improvement the operation was rendered more ſafe and certain; and it is probable that it would gradually have come into general practice, if the improved method of operating, which we have already deſcribed, had not in the mean time been introduced: But although this method will probably continue to be generally preferred, yet in particular ſituations, the operation with

the flap may with much propriety be employed. Wherever the divided parts cannot be properly covered with ſkin in any other manner, it ought certainly to be done with a flap: and this will always be the caſe in amputating the arm at the ſhoulder, and the thigh at the hip-joint, as well as in removing any of the fingers or toes; It may likewiſe by ſome be preferred to the method of operating which we have deſcribed, when it is reſolved to amputate immediately below the knee; for the teguments being in this part extremely thin, ſome will be apt to imagine that the ſtump cannot in any other manner be ſufficiently covered. But for the reaſons we have already mentioned, it can never be neceſſary, either above the knee; in operating above the ankle; nor in the arm or fore-arm. Some, however, may continue to prefer it, even in theſe parts: ſo that it will be proper to deſcribe the method of doing it in all of them. This we ſhall attempt in the following Sections.

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SECTION VII.

Of Amputating the Thigh at the Hip-Joint.

THE amputation of the thigh at the hip-joint has always been conſidered as one of the moſt hazardous operations, and therefore we have very few inſtances of its being performed. Indeed ſurgeons in general have ſpoke of it as one of thoſe operations which authors might deſcribe, but which would never be practiſed: and when we conſider the great ſize of the blood-veſſels which ſupply theſe parts; the difficulty of commanding the hemorrhagy during the operation; and the very extenſive wound which, in the uſual method of operating, muſt neceſſarily have enſued here; we will not be ſurpriſed at the averſion which has generally prevailed againſt it.

But if theſe difficulties can be removed; if danger from hemorrhagy can be prevented during the operation, as well as afterwards; if the ſore can be ſo completely covered with ſkin as to be healed in the courſe of a few weeks; and if caſes ever occur which would otherwiſe end in the death of the patient; we ſurely would not heſitate in adviſing it. Now, we hope to make it appear, that the operation may be done with very little loſs of blood; and that as much ſkin may be ſaved as will cover the ſore entirely: and no practitioner will doubt of diſeaſes taking place at the top of the thigh, which cannot be removed but by amputating the limb.

Having already treated fully of the cauſes by which amputation of limbs may be rendered neceſſary, we ſhall now refer to what was ſaid upon that part of the ſubject; and at preſent ſhall only obſerve, that gun-ſhot wounds, accompanied with fractures of this part of the bone; ſpina ventoſa, or caries of the head of the femur, will be the moſt

moſt frequent cauſes of amputating at the joint of the hip. When the operation is reſolved upon, it may be performed in the following manner:

The patient ſhould be placed upon a table; and it will be found that the parts that are meant to be divided will be brought moſt clearly into view by laying him on the ſound ſide. In this ſituation he ſhould be ſecured by two or three aſſiſtants, while another aſſiſtant takes the management of the limb.

Let a ſmall pad or cuſhion be now placed upon the femoral artery, immediately after it paſſes out from beneath Poupart's ligament into the thigh; and, by means of a tourniquet applied as near as poſſible to the top of the limb, let the circulation be completely ſtopped. Let the ſkin, membrana adipoſa, and tendinous faſcia of the thigh, be divided by a circular inciſion ſix inches from the top of the thigh; that is, at leaſt three inches beneath the circular band of the tourniquet. Let the retracted ſkin be pulled an inch upwards; and at the

the edge of it let the amputating-knife be applied, ſo as with one perpendicular circular ſtroke the muſcles may be cut down to the bone. If the muſcles be freely divided, they will retract ſo much as to admit of ſufficient ſpace for ſecuring not only the femoral artery but all the muſcular branches. This being done, take a ſtrong round-edged ſcalpel, larger than the common ſize, and commencing at the upper edge of the circular cut on the poſterior part of the thigh, make a deep inciſion down to the bone, and carry it up of the ſame depth to a little above the great trochanter into the joint. Let a ſimilar cut be made on the oppoſite ſide of the limb, at a ſufficient diſtance from the femoral artery, and completely down to the bone. Let the two portions of fleſh be now diſſected from the bone, and the flaps formed by them be taken care of by aſſiſtants, while any artery that may be cut ſhould be tied as ſoon as it is obſerved. The joint being laid bare, ſome dexterity will be required

quired to diſengage the head of the femur from the acetabulum; for it is rendered difficult from being tied down to it by the ligamentum rotundum: But by turning the bone in different directions, and particularly by preſſing it inwards, where it yields moſt readily from the brim of the acetabulum being loweſt, the head of it will be ſo far turned out of the ſocket on the oppoſite ſide as to admit of the ligament being reached with the point of a ſcalpel or a firm probe-pointed biſtoury; but to accompliſh this, the muſcles muſt all be previouſly detached from the bone.

The head of the bone being taken out and the limb removed, we may examine the ſtate of the acetabulum: for if it be ſound, our proſpect of a cure will be more favourable than if any part of it be carious. But in whatever ſtate the bones may be, our treatment of the ſore muſt be the ſame: we muſt endeavour to cure it as nearly as poſſible by the firſt intention: For which purpoſe, after re-

removing all the coagulated blood from the ſurface of the wound; placing the muſcles as nearly as poſſible in their natural ſituations; and drawing the two flaps together, ſo as to cover the ſore as neatly as may be; they ſhould be ſecured in this ſituation by three or four ſutures introduced at the moſt proper points; by adheſive plaſters; and by proper compreſſes retained with a broad flannel roller paſſed different times round the body, and ſpirally over the ſtump; care being taken to leave the ligatures upon the arteries of a ſufficient length to admit of their being afterwards drawn out.

The patient ſhould now be laid in bed, and treated in other reſpects as we have adviſed in general after the Operation of Amputation: Only it muſt be remarked, that more than ordinary attention will be required to prevent and remove ſuch febrile ſymptoms as uſually ſucceed to amputation; for where ſuch a conſiderable part of the body is ſuddenly taken away, almoſt a fourth part of the whole,

we may reſonably conclude that the effect produced by it upon the ſyſtem muſt be conſiderable. If the patient is plethoric, it will be proper to diminiſh the quantity of blood; in the firſt place by venæſection, and afterwards by a low diet: Indeed moderate living ſhould be perſevered in, if not for life, at leaſt for a great length of time.

The dreſſings may be removed at the uſual time, and in the courſe of ten or twelve days the ligatures may be all taken away; when any part of the ſore that remains open may be covered, by drawing the ſkin over it, and ſecuring it with adheſive plaſter. In ſuch an extenſive ſore, it is indeed probable that matter may collect in different parts beneath the ſkin; for the preſſure applied upon it, will not be ſo equal as in common caſes of amputation: but the inconvenience ariſing from this will not be great; for if the matter cannot be diſcharged by altering the preſſure, it will be eaſily done with the point of a lancet,

cet, by which this obſtruction to the cure will be removed.

At all times this will neceſſarily be conſidered as a very formidable operation: But when performed in the manner we have adviſed, much of the hazard, and many of the inconveniences uſually ſuppoſed to attend it, will be removed; nor ſhould any practitioner accuſtomed to operate, heſitate in performing it, when the life of a patient will otherwiſe be endangered. By the tourniquet, we effectually command the circulation in the limb till all the large blood-veſſels divided by the circular inciſion are tied; and by ſecuring the different arteries that are cut in making the longitudinal inciſions as ſoon as they appear, the loſs of blood will be inconſiderable: Nor will there be any riſk of hurting the femoral artery in the courſe of ſeparating the flap in which it is ſeated from the bone, if it be done with caution.

It may be alleged, that by this method

of operating, more of the teguments and muſcles will be ſaved than are neceſſary for covering the ſore: But it muſt be remembered, that the ſore will here be very extenſive, and that the divided muſcles will retract conſiderably. And beſides, the tourniquet could not be applied if the firſt cut was much higher than we have directed; by which the operation would neceſſarily be rendered much more dangerous: Nor can any riſk occur from the teguments and muſcles being left ſomewhat longer than might be juſt required for the purpoſe above mentioned, while much inconvenience would enſue from their being deficient.

In the ſixth volume of the Medical Commentaries of Edinburgh, a caſe is recorded, in which the thigh was amputated at this joint by Mr Kerr ſurgeon in Northampton. In this caſe, the diviſion of the femoral artery was reſerved to the laſt; nor was the tourniquet employed. No hemorrhagy indeed occurred;

red; but there was ſurely more riſk of this than if the operation had been done in the manner we have adviſed: Nor could the operator uſe ſuch freedom with the bone, in removing the head of it from the ſocket, as long as the blood-veſſels remained undivided. We may remark, however, that this caſe affords an inſtance of this operation being practiſed with ſafety: For although the patient died, yet ſhe lived eighteen days after the operation, and at laſt died from a different cauſe, when all riſk of hemorrhagy was over, and when the ſore had even a favourable appearance.

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SECTION VIII.

Of the Flap Operation immediately above the Knee.

WHEN this operation is to be performed above the knee, it may be done either with one or two flaps, but it will commonly ſucceed beſt with one. It is moſt convenient to have the flap on the fore-part of the thigh; for here there is a ſufficiency of ſoft parts for covering the bone, and the matter paſſes more freely off than when the flap is formed in any other direction.

The patient being placed upon a table, the tourniquet being applied in the uſual way at the top of the thigh, and the teguments drawn firmly up and retained by an aſſiſtant, the extent of the intended flap ſhould be marked with ink.

A perſon much accuſtomed to this operation may not require this aſſiſtance; but it will be done with more neatneſs and exactneſs if the form and extent of the flap be previouſly marked.

The extreme point of the flap ſhould reach to the end of the limb, unleſs the teguments be in any part diſeaſed; in which caſe, it muſt terminate where the diſeaſe commences, and its baſe ſhould be where the bone is to be ſawn. This will determine the length of the flap; and we muſt be directed with reſpect to the breadth of it by the circumference of the limb: For, the diameter of a circle being ſomewhat more than a third of its circumferance, although a limb may not be exactly circular, yet by attention to this circumſtance, we may aſcertain with ſufficient exactneſs the ſize of a flap for covering a ſtump. Thus, a flap of four inches and a quarter in length, will reach completely acroſs a ſtump whoſe circumference is twelve inches; but as ſome allowance muſt be made for

the quantity of ſkin and muſcles that may be ſaved on the oppoſite ſide of the limb, by cutting them in the manner we have directed, and drawing them up before ſawing the bone; and as it is a point of importance to leave the limb as long as poſſible, inſtead of four inches and a quarter, a limb of this ſize, where the firſt inciſion is managed in this manner, will not require a flap longer than three inches and a quarter, and ſo in proportion according to the ſize of the limb. The flap at its baſe ſhould be as broad as the breadth of the limb will permit, and ſhould be continued nearly, although not altogether, of the ſame breadth to within a little of its termination, where it ſhould be rounded off ſo as to correſpond as exactly as may be with the figure of the ſore on the back part of the limb. This being marked out, the ſurgeon ſtanding on the outſide of the limb ſhould puſh a ſtraight double-edged knife with a ſharp point to the depth of the bone, by entering the point of it at the outſide

outſide of the baſe of the intended flap; and carrying the point cloſe to the bone, ſhould puſh it through the teguments at the mark on the oppoſite ſide. The edge of the knife muſt now be carried downwards, in ſuch a direction as to form the flap, according to the figure marked out; and as it draws towards the end, the edge of it ſhould be ſomewhat raiſedfrom the bone, ſo as to make the extremity of the flap thinner than the baſe; by which it will apply with more neatneſs to the ſurface of the ſore. The flap being ſupported by an aſſiſtant, the teguments and muſcles on the back part of the limb ſhould, by one ſtroke of the knife, be cut down to the bone about an inch beneath where the bone is to be ſawn; and the muſcles being ſeparated to this height from the bone with the point of the knife, the ſoft parts muſt all be ſupported with the leather retractors, Plate LXXXIV. fig. 4. till the bone is ſawn; and any ſplinters that may be left, are

cut

cut off. All the arteries that diſcharge much blood muſt now be ſecured in the uſual way with the tenaculum, the ligatures being left of a ſufficient length for hanging out at the edge of the flap.

The muſcles and teguments ſhould now be drawn down and ſecured with a flannel or cotton roller, in the manner we have adviſed when a leg is amputated with a circular inciſion; and the flap may now be laid down over the ſurface of the ſore, ſo as to effect a cure as much as poſſible by the firſt intention; or it may be dreſſed as a ſeparate ſore, agreeable to the practice of Mr O'Halloran, according to the judgment of the operator. If it is to be applied immediately, the coagulated blood ſhould be carefully ſponged out, and it ſhould be ſecured to the muſcles and teguments ſurrounding the reſt of the ſtump by three or four ſutures paſſed at leaſt three quarters of an inch into the muſcular ſubſtance of the flap: But care ſhould be taken not to draw

draw the ligatures ſo tight as to create much irritation or pain. The under part of the ſtump ſhould now be covered with a large pledgit of common cerate; and a cuſhion of ſoft tow being laid over it, the whole ſhould be ſecured in the manner we have formerly adviſed, with croſs ſtraps of linen and a few turns of a circular roller.

In three or four days the dreſſings may be renewed; and as ſoon as the ligatures are all removed, and the tenſion and inflammation induced by the operation abated, any part of the ſore which was not covered at firſt may now have the ſkin drawn over it, and ſecured with adheſive plaſters.

But if Mr O'Hallaron's method is to be adopted, the eaſieſt mode of proceeding is this. The muſcles and teguments being drawn down and ſecured with the roller, let the whole ſurface of the ſtump be covered with a pledgit of ſoft lint ſpread on both ſides with any ſoft emollient ointment: Let the flap be laid down

down upon this; and another pledgit of the ſame kind being laid over the whole with a cuſhion of tow and a compreſs of ſoft linen, the croſs ſtraps and circular roller ſhould be employed to ſupport them, but with no more preſſure than is neceſſary for this purpoſe. At the end of three or four days the dreſſings may be renewed in the ſame manner; and about the twelfth or fourteenth day, or whenever the tenſion induced by the operation is removed, the ligatures all taken out, and a proper ſuppuration eſtabliſhed, the flap may be brought into contact with the ſore beneath with a view to make them unite. For this purpoſe, any matter that may be obſerved upon the ſurface of either of them ſhould be gently removed with a ſoft ſponge; and the flap being laid down with as much exactneſs as poſſible, it may either be ſecured with adheſive plaſters ſupported by the bandage above mentioned, or two or three ſutures may be employed. This laſt method will give more

pain

pain than the other; but this will be amply compenſated by the flap being retained in its ſituation with much more certainty and exactneſs.

Farther experience muſt evince which of theſe methods ſhould be preferred, for as yet it is not determined. It is my own opinion, that the ſecondary union recommended by Mr O'Halloran is the beſt: for the pain, tenſion, and inflammation which enſue from the other, run often ſo high as to render it neceſſary to remove the dreſſings and even the ligatures; by which a great deal of additional trouble is given to the practitioner and much diſtreſs to the patient: whereas, when the tenſion and inflammation are gone before the flap is laid down, little or no pain is induced by it; nor is the cure effected in this manner more tedious: On the contrary, it would appear to be in general accompliſhed more quickly in this way than in any other. Even where the flap has not been ap-

plied to the ſore till the fourteenth day, the cure has been completed before the fourth week: Whereas few, if any, cures have been effected ſo early where the flap has been applied immediately after the operation.

In operating with two flaps, the following is perhaps the eaſieſt method: The patient being placed upon a table, and the tourniquet applied, let the ſkin be drawn up by an aſſiſtant, and a circular inciſion be made through the teguments and muſcles down to the bone at the moſt inferior parts of the limb, with the edge of the knife turned obliquely upwards: Let the ſharp-pointed knife, mentioned above, be now puſhed through the ſkin and muſcles on one ſide of the limb down to the bone, at that part where the bone is to be ſawn; and the under edge of the knife being turned obliquely outwards, let the muſcles be divided down to the circular inciſion. The teguments and muſcles on the oppoſite ſide of the limb muſt now be divided

vided by a ſimilar inciſion, when any of the intermediate ſoft parts that may have been left muſt likewiſe be cut; and the bone being ſawn, and the veſſels ſecured with ligatures, the cure may either be attempted by laying the flaps together immediately, or they may be kept ſeparate twelve or fourteen days, and treated afterwards in the manner we have adviſed above.

SECTION IX.

Of the Flap Operation below the Knee.

IN ſpeaking of this operation below the knee, it is not neceſſary to deſcribe all the ſteps of it. The views of the operator are the ſame here as in operating above the knee, and the method of effecting them is nearly ſimilar.

After the previous ſteps of the operation are taken, the ſize and form of a flap ſufficient to cover a conſiderable part of the ſore muſt be marked out with ink; this muſt be ſeparated from the parts beneath in the manner we have already adviſed: The reſt of the ſoft parts muſt be divided, taking care to ſave as much of the teguments on the ſide of the limb oppoſite to the flap as with the flap itſelf will nearly or entirely cover the ſore; and the cure muſt afterwards be conducted either by applying the flap immediately, or after the ſymptoms of pain, tenſion, and inflammation induced by the operation are gone, and treated in the manner we have adviſed in the laſt ſection.

It muſt be obſerved, however, that in operating beneath the knee, the flap cannot be formed on the fore-part of the limb as is done in the thigh; for on this part of the leg there is no muſcular ſubſtance; and for this reaſon, we are adviſed by authors to form the flap on the back-

back part of the leg. But this is liable to one very important objection, the difficulty of preventing matter from lodging between the flap and the ſore after they are brought into contact: for it muſt be remarked, that it is moderate preſſure only which we dare venture to apply to the flap; ſo that it is ſcarcely poſſible to prevent the matter from collecting where it does not find a free vent below.

Inſtead of forming the flap from the muſcles of the back part of the leg, it may be done with more propriety upon the outſide of the limb, where there is a ſufficient quantity of muſcular ſubſtance for this purpoſe. The point of the knife ſhould be entered on the outſide of the ridge of the tibia at the part where the bone is to be ſawn; and being carried backwards in a direct line, and at a proper depth to the oppoſite ſide of the baſe of the flap, the edge of it muſt afterwards be carried down the line previouſly marked with ink as a direction

for the form and length of it. In this manner the bones may be covered with a flap of a ſufficient thickneſs, while the matter which forms in the progreſs of the cure, finding a ready outlet by the inferior edge of the flap, will not be allowed to lodge.

In operating immediately above the ankle, there is a neceſſity for leaving the flap behind, for there is not a ſufficient quantity of ſoft parts to admit of it in any other ſituation. But we have elſewhere obſerved that the leg ſhould never be taken off ſo immediately above the ankle, as it leaves the ſtump too long for a machine to be rightly adapted to it for the purpoſe of walking: But at nine inches from the condyles of the femur, which in an adult is the moſt proper length for this purpoſe, the flap may with propriety be formed, in the manner we have mentioned, on the outſide of the leg.

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SECTION X.

On Amputating the Foot, Toes, and Fingers.

WHEN the whole foot is diſeaſed, it becomes neceſſary to take off the limb at the part we have mentioned above the ankle; nay, this ſhould be done even where the parts about the joint are ſound, if all the reſt of the foot is diſeaſed: For although ſome have recommended the amputation of the foot at the joint of the ankle, yet the practice ſhould not be adopted, as the ſore cannot be properly covered, nor is the ſtump when of this length ſo uſeful: But when any conſiderable part of the foot remains ſound, it ought undoubtedly to be ſaved, and the diſeaſed part of it only removed. I have ſeen a whole foot taken

off, where two of the metatarſal bones only have been diſeaſed: while, on the contrary it ſhould be laid down as a fixed rule, to remove the diſeaſed parts alone, even where two of theſe bones only remain ſound; for with the aſſiſtance of a ſhoe properly ſtuffed, and with a firm unyielding ſole, even a very ſmall part of the foot proves uſeful in walking: And this eſpecially when the bones on the inſide of the foot, or thoſe correſponding to the great toe and thoſe next to it, are left.

When the middle part only of the foot is diſeaſed, the metatarſal bones on each ſide remaining ſound, theſe ſhould be left, and the diſeaſed part only taken out. In this caſe, the affected bones ſhould be taken out at the joint whether they be diſeaſed through their whole length or not; for although inſtruments might be invented for cutting even a ſingle bone acroſs in the centre of the foot, the operation would neceſſarily be much more tedious, and more painful, than

than the removal of the bone at the joint, at the ſame time that little or no advantage would be derived from ſaving a ſmall portion at the end of it. But where one, two, or three of the bones on either ſide of the foot are only partially diſeaſed, as in this caſe it becomes an object to ſave as much of the foot as poſſible, the operation ſhould be ſo conducted that the bones may be ſawn acroſs nearly at the termination of the diſeaſed parts.

In every caſe of amputation, it is an object of importance to ſave as much ſkin as will cover the ſore; but it is particularly neceſſary in amputating any part of the foot where the effect of friction is much to be dreaded in walking. In making the inciſion, therefore, at that part of the bone where the ſaw is to be applied, it ſhould be done in ſuch a manner, that a flap may be ſaved of a ſufficient ſize for covering the ſore. With a little attention this may always be done, nor is it often attended with any diffi-

culty; for the flap may be formed either above or below, or on one ſide of the toe, according as the teguments are ſound or otherwiſe. But it is proper to remark, that where the ſkin is ſound, it anſwers beſt to ſave it below; as in this ſituation it is firmer, and therefore more able to reſiſt the effects of preſſure.

This operation is moſt eaſily performed when the patient is placed upon a table. The tourniquet ſhould be applied above the knee, with a compreſs placed upon the artery in the ham; the limb ſhould be firmly ſecured by aſſiſtants; and on ſawing the bone, a piece of paſteboard, or thin ſplint of timber, ſhould be inſerted between it and the contiguous ſound bone, to protect the latter from the teeth of the inſtrument.

The diſeaſed parts being removed, and any artery that is cut ſecured, the flap ſhould be applied as exactly as poſſible to the ſore, and retained with ſlips of adheſive plaſter and gentle preſſure with a flannel roller. If ſutures are employed,

ployed, they ſhould be inſerted in ſuch a manner as to avoid the flexor and extenſor tendons of the toes and foot.

In amputating the toes and fingers, the operation uſed formerly to be done by one ſtroke with a chiſel and mallet; but this is liable to many objections, and has been long in diſuſe. In general, fingers and toes are amputated in the ſame manner with the larger extremities, either by preſerving a flap ſufficient for covering the ſore, and afterwards dividing the bone with a ſmall ſpring ſaw repreſented in Plate LXXXIV. fig. 1. or by the double inciſion, performed in the manner we have adviſed in Section IV. of this Chapter. But inſtead of this, it has for ſeveral years been the practice of ſome individuals, to amputate fingers and toes at the joints; and whoever will give it a fair trial, will readily prefer it. The patient being placed upon a table, and the limb properly ſecured, a flap ſhould be marked with ink of a ſufficient ſize for covering the ſore. This

being diſſected from the bone with a ſcalpel, and ſupported by an aſſiſtant, a circular inciſion ſhould be made through the reſt of the ſoft parts, a little below the joint, and on a line with the baſe of the flap. The lateral ligament ſhould now be cut; and in order to determine the point at which this ſhould be done, an aſſiſtant ſhould be directed to move the finger. This ligament being diyided, the joint is eaſily diſlocated, when the remainder of the operation may be quickly finiſhed. If it is neceſſary to tie an artery, it ſhould be done with the tenaculum. The flap muſt be applied to the ſore, and ſecured as neatly as poſſible with adheſive plaſters, and moderate preſſure with a flannel roller.

The only objection that has been made to this practice is, the ſuppoſed uncertain union of the contiguous ſoft parts with cartilage. But we now know, that there is no cauſe for this apprehenſion, and that a flap will unite as readily with

cartilage

cartilage as with bone, at leaſt I have uniformly obſerved this to be the caſe; and we find from Mr Alanſon's publication, that the practice has proved very ſucceſsful in the courſe of his experience.

SECTION XI.

Of Amputating the Arm at the Joint of the Shoulder.

THIS operation having always been conſidered as hazardous and difficult to perform, it has not frequently been attempted: But although it ſhould never be adviſed when our purpoſe can be accompliſhed by amputating lower, yet no practitioner of modern times will decline it, when the life of a patient cannot in any other manner be ſaved. Abſceſſes

ſceſſes in the joint, caries of the humerus reaching to the joint, compound fractures extending to the head of the bone, gunſhot wounds and mortification, may render amputation of the arm at the ſhoulder neceſſary.

The operation may be performed with ſafety by any ſurgeon of ſteadineſs and experience, and who is poſſeſſed of an accurate knowledge of the anatomy of the joint and contiguous parts.

It may be done in different ways; but the following I believe to be the beſt.

The patient ſhould be placed upon a table of a convenient height, covered with a matreſs and blanket; and he ſhould be laid upon his back, and properly ſecured by aſſiſtants, as near as poſſible to one ſide of the table.

The next object is to guard againſt hemorrhagy: for this purpoſe we might adviſe the tourniquet to be placed upon the upper part of the limb, in a manner ſimilar to what we have propoſed in amputating

putating at the hip-joint. But here it is unneceſſary, as the blood may be completely ſtopped in its flow to the arm, by compreſſing the ſubclavian artery as it paſſes over the firſt rib: for this purpoſe, an aſſiſtant ſhould be properly placed, with a firm cuſhion or compreſs applied upon the courſe of this artery directly above the clavicle, who with his fingers ſhould make ſuch a preſſure as may be neceſſary: It will readily be known whether it proves effectual or not, by its influence on the pulſation at the wriſt.

The circulation being ſtopped, the diſeaſed ſhoulder ſhould be made to project ſomewhat over the ſide of the table; and the arm being ſtretched out and ſupported by an aſſiſtant at nearly a right angle with the body, a circular inciſion ſhould be made through the ſkin and cellular ſubſtance juſt at the inſertion of the deltoid muſcle into the humerus. The teguments may be allowed to retract about half an inch; and at the edge of the retracted

retracted ſkin, the knife may be applied ſo as to divide the muſcles with a perpendicular circular cut down to the bone. Thus far we proceed with the common amputating knife; but the remainder of the operation ſhould be finiſhed with a ſcalpel. With a firm round-edged ſcalpel a perpendicular inciſion ſhould now be made down to the bone, commencing at the acromion, about half way between the centre of the deltoid muſcle and the inner edge of it, and terminating in the circular inciſion about an inch above, or rather on the outſide of the brachial artery. This being done, a ſimilar cut muſt be made on the back part of the arm, commencing at the ſame height with the other, and ending in the circular inciſion. This ſhould be at ſuch a diſtance from the firſt, that the two flaps formed by them both may be nearly of an equal breadth. The brachial artery ſhould be tied as ſoon as it is cut by the circular inciſion through the muſcles; and any anaſtomoſing muſcular branches of arteries that may be

cut

cut on the upper and back part of the joint ſhould be tied immediately on being obſerved. The two flaps ſhould now be ſeparated from the bone, care being taken to avoid the large artery in diſſecting off that part of the flap with which it is connected. An aſſiſtant muſt ſupport the flaps ſo as to bring the capſular ligament of the joint into view; when an opening being made into it, the head of the bone will be eaſily diſlocated by drawing the arm backward; and this being done, the operation will be eaſily finiſhed by dividing the remaining part of the ligament.

Any arteries that may have been cut about the joint being tied, the ligatures hanging out at the moſt depending part of the wound, and the parts cleared of coagulated blood, the two flaps ſhould be laid together ſo as to cover the joint as neatly as poſſible, and retained in their ſituation by two or more ſutures. A pledgit of lint ſpread with any emollient ointment ſhould now be laid over the

joint; and a ſoft cuſhion of tow or of lint, with a compreſs of old linen, being applied over the whole, a flannel roller ſhould be employed to make a moderate preſſure upon the joint; by which the flaps will be kept in contact with the parts beneath, which will not only facilitate their union, but will be the moſt effectual method of preventing matter from lodging.

In other reſpects, the patient ſhould be treated as we have adviſed in the preceding Sections, when ſpeaking of Amputation in the Lower Extremities. With a view to prevent any riſk from hemorrhagy after the operation, an aſſiſtant of experience ſhould ſit with the patient for the firſt two or three days, with directions to apply preſſure above the clavicle in the event of any conſiderable quantity of blood being diſcharged, till the bleeding veſſel can be ſecured with a ligature. In the courſe of eight or ten days the ligatures upon the arteries will come eaſily away. If matter collects

collects beneath any part of the ſkin, it muſt be diſcharged; and if the patient is healthy and no untoward circumſtance happens, a cure may ſoon be expected.

Till of late, it was the practice in this operation to tie the brachial artery and veins with a ligature before proceeding farther. This gave much unneceſſary pain, at the ſame time that it did not render the patient more ſecure. In the way we have mentioned, the operation may be performed with no riſk from the hemorrhagy; and by tying the artery at the extremity of the flap, ſeveral muſcular branches will be ſaved which would be cut off by tying it near the axilla.

Mr Bromfield, in the firſt volume of his Obſervations and Caſes, has given the beſt account yet publiſhed of this operation. The principal difference between this method of doing it and the one we have deſcribed, conſiſts in the latter being more ſimple, and therefore more eaſily performed. By dividing the muſ-

cles down to the bone with a circular inciſion, the operation is more ſpeedily done than by cutting firſt one muſcle and then another, in the manner mentioned by Mr Bromfield. And as the attachments of the latiſſimus dorſi, the deltoid and pectoral muſcles, as well as of all the other muſcles of the arm, are removed by the arm being taken away, there is no neceſſity for proceeding with ſlowneſs and caution in dividing them; nor is it neceſſary to employ two ligatures upon the brachial artery, one conſiderably higher than the other, as is adviſed by that author; one ligature applied in the uſual way with the tenaculum is quite ſufficient, if it be done with care and attention. And Mr Alanſon very properly obſerves, in ſpeaking of this operation, that there is no neceſſity for ſcraping off the cartilage from the acetabulum of the joint, as is recommended by Mr Bromfield; for we find by experience, as we have obſerved in the

the laſt Section, that the teguments adhere to cartilages as readily as to bone.

SECTION XII.

Of Amputating the Arm.

THE general obſervations we have made upon the method of amputating the thigh and leg, apply with the ſame propriety to the amputation of the arm and forearm. At preſent, therefore, we ſhall only obſerve, that in amputating the arm, no more of it ſhould be removed than is diſeaſed; for the longer the ſtump is, the more uſeful it proves: and the ſame attention ſhould be given to the ſaving of teguments for covering the ſore that we have adviſed in Amputating the Leg. But it is proper to remark, that this may always be done both in the arm and forearm without the aſſiſtance of a flap: for there is in every part of both a ſufficiency

both of muſcles or cellular ſubſtance, for admitting of the ſore being completely covered by amputating with the double inciſion, in the manner we have pointed out; and wherever this can be done, it ſhould be preferred to the method of operating with a flap.

CHAP.

CHAP. XLIV.

Of removing the Ends of BONES *in Diſeaſes of the* JOINTS.

THE amputation of limbs is more frequently adviſed for affections of the joints than for any other cauſe; and as this often happens where the reſt of the limb is ſound, it were to be wiſhed that with ſafety and propriety we could remove ſuch parts as are diſeaſed, and leave thoſe that are ſound. In compound fractures and diſlocations, the ends of large bones have frequently been ſawn off, when ſuch parts of them have pro-

truded as could not be replaced. The deficiency thus produced, has in moſt inſtances been ſupplied by nature; and thus the limbs have remained almoſt equally uſeful as before. In a few caſes too of diſeaſed joints, a cure has been obtained by the head of a bone being ſawn off. Among other inſtances of this to be met with in books, a remarkable one is recorded by a very ingenious and expert ſurgeon, Mr White of Mancheſter, who preſerved an arm by ſawing off the head of a diſeaſed humerus*. But Mr Park of Liverpool was the firſt who ventured to propoſe it as a general remedy in affections of the joints†. Whether or not it will ſtand the teſt of experience, farther trials muſt determine; but in the mean time, the public are much indebted to Mr Park for the pains he has taken

* *Vide* Caſes in Surgery with Remarks, Part I. by Charles White, F. R. S. &c.

† *Vide* An Account of a New Method of Treating Diſeaſes of the Joints of the Knee and Elbow, by H. Park.

taken to introduce a leſs formidable remedy in place of amputation.

What Mr Park propoſes is, that inſtead of amputating a limb for any external violence done to a joint, for a white ſwelling, a caries, or any other affection, that the diſeaſed ends of the bones ſhould be ſawn off; when nature, he thinks, will commonly ſupply the deficiency of bone; by which the limb will be preſerved, and will prove more uſeful than any machine that artiſts can invent.

Mr Park ſuppoſes that this operation will be chiefly applicable to affections of the knee and elbow, and more particulary to thoſe of the latter; and he relates a caſe of white ſwelling of the knee in which it was practiſed with ſucceſs: The under extremity of the femur and the upper end of the tibia were ſawn off; no artery of importance was injured; the vacancy produced by the removal of the ends of the bones was ſupplied with callus: in the courſe of ten weeks a cure of the ſore was obtained; the

limb became ſo firm that the man has ſince been able to go to ſea as a ſailor, and he does not even uſe a crutch.

This, however, is the moſt favourable view of the propoſal; and it is proper to remark, that in the courſe of the cure, much perplexity occurred from various circumſtances; particularly from the difficulty of preſerving the limb in a ſteady fixed ſituation; from the great depth of the wound; from the lodgement of matter; and from the formation of ſinuſes. By much attention on the part of Mr Park, all theſe difficulties were ſurmounted: But although the merits of the operation muſt be determined by farther trials, yet the riſk attending it appears to be ſo great, that there is much reaſon to ſuſpect that it will never be generally practiſed.

For a more particular detail of the method of doing it, and of the after-treatment of the ſore, the publication itſelf muſt be conſulted; but for the advantage of thoſe who may not eaſily meet with it,

it, the following ſhort account of the operation is inſerted in Mr Park's own words.

" An inciſion was made, beginning about two inches above the upper end of the patella, and continued about as far below its lower extremity: Another, croſſing this at right angles, immediately above the patella, the leg being in an extended ſtate, was made through the tendons of the extenſor muſcles down to the bone, and nearly half round the limb; the lower angles formed by theſe inciſions were raiſed ſo as to lay bare the capſular ligament: The patella was then taken out, and the upper angles were raiſed, ſo as fairly to denude the head of the femur, and to enable me to paſs a ſmall catlin acroſs the poſterior flat part of the bone immediately above the condyles, taking care to keep one of the flat ſides of the point of the inſtrument quite cloſe to the bone all the way. The catlin being withdrawn, an elaſtic ſpatula was introduced in its

place, to guard the ſoft parts while the femur was ſawing through: Which done, the head of the bone thus ſeparated was carefully diſſected out; the head of the tibia was then with eaſe turned out and ſawn off, and as much as poſſible of the capſular ligament diſſected away, leaving only the poſterior part covering the veſſels; which, on examining, I had the ſatisfaction to find had not only eſcaped unhurt, but that it was not a very narrow eſcape: They had ſtill a pretty good covering, and had been through the whole operation far enough out of the courſe of the knife. It muſt be confeſſed, that the appearance of the wound was ſomewhat formidable, exhibiting a very large cavern with very thin parietes; and in ſhort, there ſeemed little wanting to complete the amputation: Yet as the limb below would not be deprived of any part of its nouriſhment, and as every healthy inciſed ſurface, as well of bone as of ſoft parts, has a natural tendency to granulate, I could not ſee any room

room to doubt that nature would be able to repair the breach."

Mr Park afterwards informs us, that he attempted to perform the operation without making the tranſverſe inciſion: but he found it could not be done; and after ſpending ſome time in the attempt, it was thought adviſable to deſiſt from it. More than two inches of the femur, and rather more than one inch of the tibia, were removed; which were but juſt enough to admit of the leg being brought into a right line with the thigh, the previous contraction of the flexor muſcles being ſuch as to keep the two ſawn ends of bone in cloſe contact: This produced a conſiderable redundance of the teguments. To ſupport this, that it might not fall inward, and to keep the edges of the inciſion in appoſition till they ſhould acquire ſome degree of firmneſs, a few ſtitches were paſſed through the ſkin; not merely along the courſe of the tranſverſe inciſion, but upon that part of the longitudinal cut that extended up the

the thigh. The lighteſt ſuperficial dreſſings only were applied, and the limb placed in a caſe of tin from the ankle to the inſertion of the gluteus muſcle.

Mr Park very candidly enumerates ſeveral objections which may be made to this operation; but at the ſame time, he thinks that all of them may be obviated. There are two, however, which, in my opinion, will always appear with force againſt it: The firſt is, that where the bones of large joints are ſo much diſeaſed as to render it neceſſary to remove them, the ſurrounding ſoft parts are for the moſt part ſo much thickened, inflamed, or ulcerated, as to render any attempt to ſave them very uncertain, and much more hazardous than the amputation of the limb: And the ſecond is, the high degree of inflammation which commonly ſucceeds to wounds of the larger joints.

With reſpect to the firſt of theſe, Mr Park himſelf wiſhes it to be underſtood, that it is chiefly in affections of the joints

produced by external violence, that he thinks this operation will be peculiarly uſeful; and, with reſpect to the laſt, he obſerves, that the heads of large bones have been frequently ſawn off, without any violent ſymptoms enſuing: and as he ſuppoſes this to be owing to the very free diviſion of the capſular ligaments, which in ſuch caſes muſt always take place, he thinks that the total removal of this ligament, which he adviſes in this operation, will in a great meaſure prevent it. We have obſerved above, that experience alone can determine upon the merits of this operation; but we cannot avoid remarking, that no neceſſity appears for the removal of any part of the capſular ligament. It may be highly proper to make the opening into it free and large; but to remove it, by diſſecting it off from the contiguous parts, muſt probably add to the riſk of the operation, by rendering the inflammation more ſevere than it otherwiſe might be; at the ſame time that it muſt neceſſarily render

render it much more painful as well as more tedious. Farther experience may perhaps ſet this in a different point of view: but at preſent we ſee no more reaſon for removing any part of the capſular ligament in this operation, than for the removal of the tunica vaginalis teſtis in the operation for the hydrocele; a practice now altogether laid aſide, even where the cyſt is much thickened.

CHAP.

CHAP. XLV.

Of Preventing or Diminiſhing PAIN *in* CHIRURGICAL OPERATIONS.

TO be able to alleviate the miſery of thoſe who are obliged to ſubmit to dangerous operations, muſt afford the higheſt gratification to every practitioner: And as pain is the moſt dreadful part of every operation, it neceſſarily demands our moſt ſerious attention.

The pain induced by operations may be leſſened in different ways: By diminiſhing the ſenſibility of the ſyſtem; and by compreſſing the nerves which ſupply

ſupply the parts upon which the operation is to be performed.

Narcotics of every kind might be employed for the purpoſe of leſſening general ſenſibility; but nothing anſwers this with ſuch certainty and effect as opium.

But as medicines of this kind, when given in ſuch large doſes as to prevent or diminiſh pain, are apt to induce ſickneſs and vomiting, I ſeldom venture on giving them before an operation. In general they prove moſt uſeful when given immediately after, when they very commonly alleviate that pungent ſoreneſs of which patients at this time uſually complain; and by continuing to give them in adequate doſes from time to time, we are often enabled to keep the patient eaſy and comfortable, till relief is obtained by the formation of matter, or by the removal of that inflammatory tenſion which uſually accompanies every capital operation: And as this proves not only highly comfortable to the patient, but tends in the moſt effectual man-

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PLATE LXXVI.

FIG. 1.

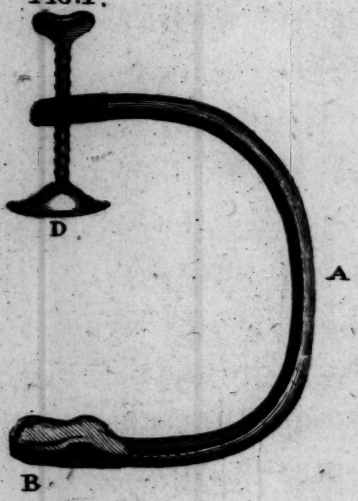


FIG. 2.

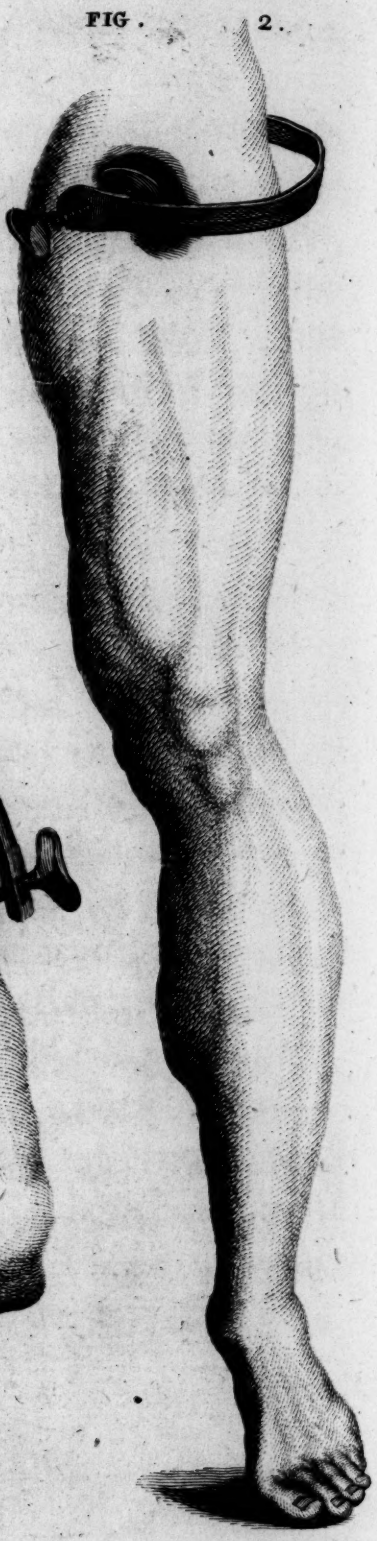
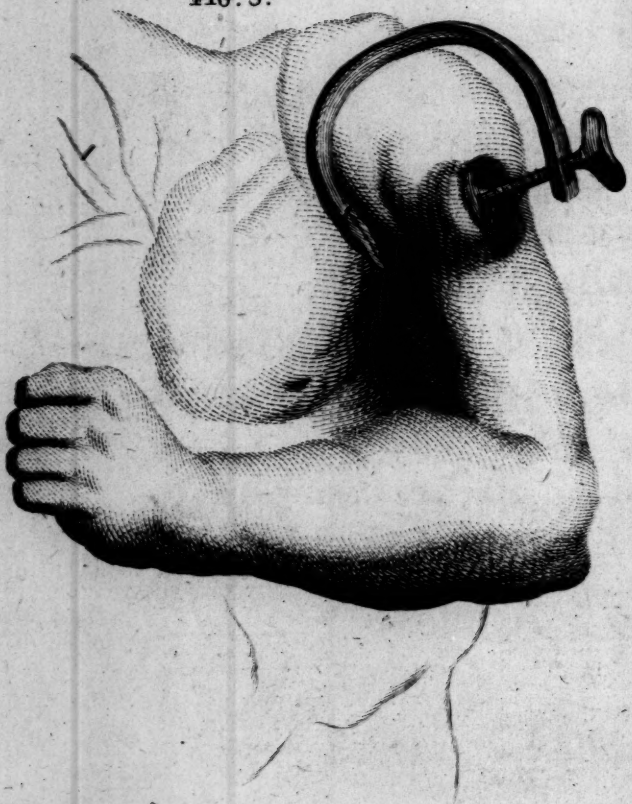


FIG. 3.



manner to moderate the febrile ſymptoms which commonly take place, it ſhould never be omitted.

It has long been known, that the ſenſibility of any part may not only be leſſened, but even altogether ſuſpended, by compreſſing the nerves which ſupply it: And accordingly, in amputating limbs, patients frequently deſire the tourniquet to be firmly ſcrewed, from finding that it tends to diminiſh the pain of the operation.

The effect of this, however, being inconſiderable, it has lately been propoſed by Mr James Moore of London, to compreſs the principal nerves ſo completely as to render the parts beneath altogether inſenſible. In Plate LXXIII. an inſtrument is delineated, by which this may be very effectually done.

Whether or not it will anſwer with eaſe and certainty, experience alone muſt determine: But, in the mean time, we are much indebted to the ingenious author, for affording a hint which eventu-

ally

ally may tend to mitigate the ſufferings of thoſe whom neceſſity obliges to ſubmit to chirurgical operations. All that this inſtrument ſeems to require in order to render it perfect, is the power of compreſſing the nerves of a limb without affecting the veins: for as it is found that the nerves muſt be compreſſed for a conſiderable time, at leaſt an hour, before the parts beneath are rendered altogether inſenſible, the veins could not be compreſſed for ſuch a length of time but with the riſk of burſting. With a view to prevent ſuch a diſagreeable occurrence, Mr Moore propoſes that one of the veins in the limb ſhould be opened: But as this might prove hurtful to weakly patients, where it is often of importance to guard againſt the loſs of blood, it would be better to avoid it, by having the inſtrument formed in ſuch a manner, that it might compreſs the principal nerves only without materially affecting the veins. It will not indeed be eaſily done, as the nerves for the moſt part are at no

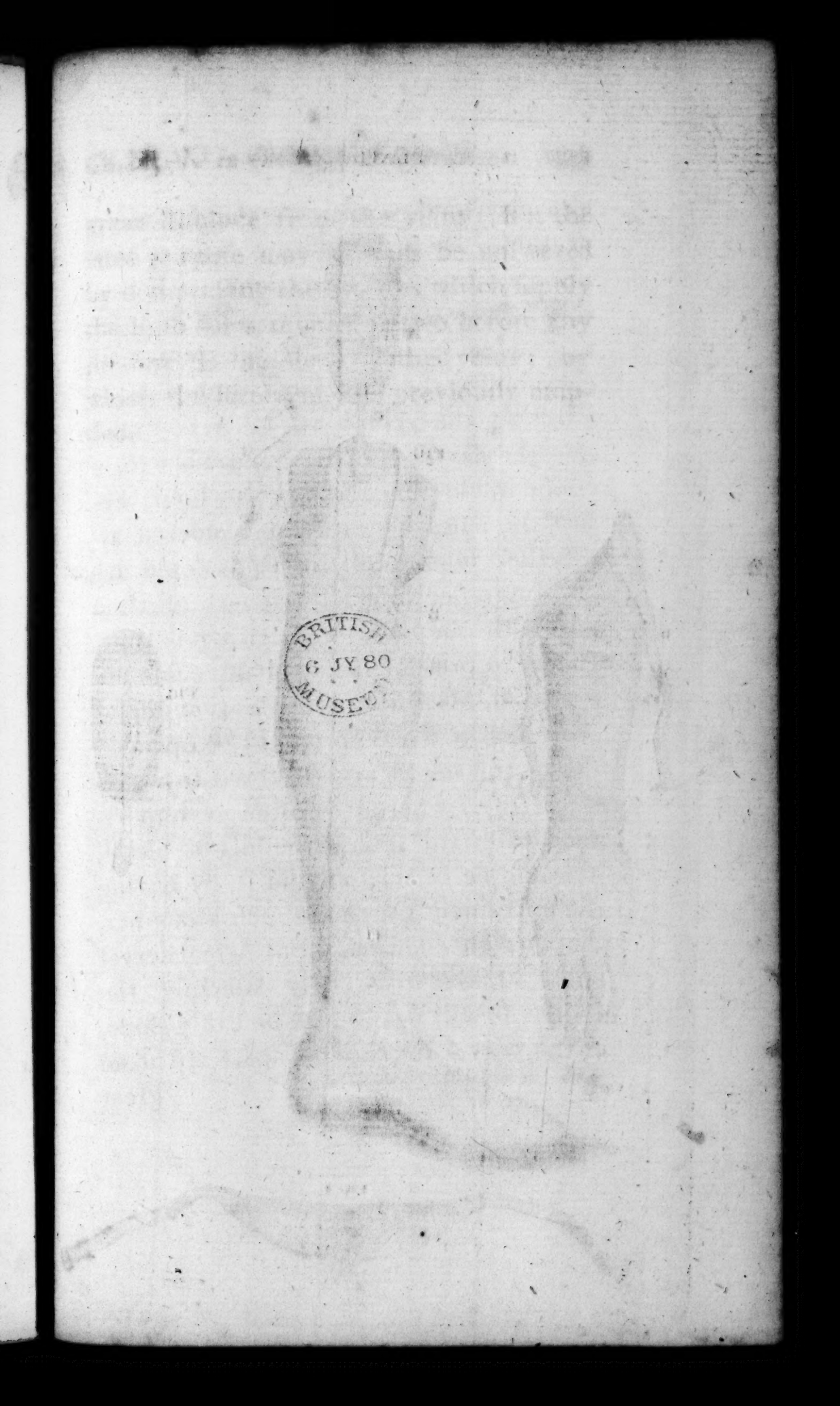
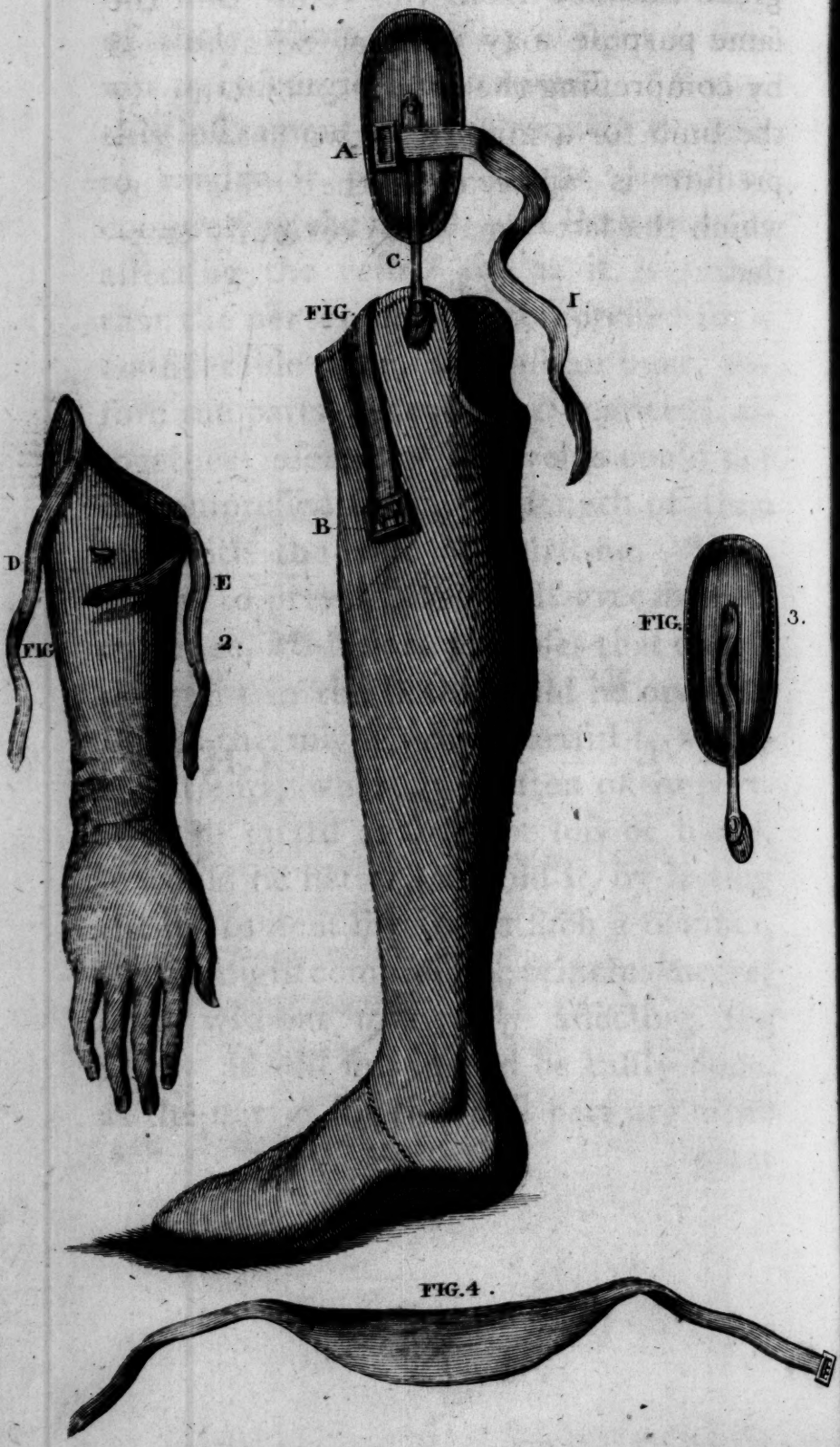

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PLATE LXXXVII



great diſtance from the veins: But the ſame purpoſe may perhaps be anſwered by compreſſing the arteries which ſupply the limb for a minute or two before any preſſure is applied to the veins; by which the latter may be previouſly emptied.

CHAP. XLVI.

Of MIDWIFERY.

SECTION I.

General Observations on Midwifery.

MIDWIFERY being now considered as a distinct branch of practice, a minute account of it will not be expected in a System of Surgery. For more particular information, those authors who have wrote upon the subject may be consulted: but I have judged it proper to delineate the instruments usually employed in Midwifery

Midwifery; and to deſcribe two operations, which although immediately connected with this branch, are yet more frequently performed by the ſurgeon than the accoucheur; namely, the Cæſarean operation, and the diviſion of the ſymphyſis pubis.

A great variety of inſtruments have been invented by practitioners in midwifery; almoſt every publication indeed upon this ſubject announces ſome invention of this kind. It is only thoſe inſtruments, however, which experience has ſhown to be uſeful, that we mean to deſcribe: theſe are not numerous; they are all delineated in Plates LXXXIX. XC. XCI. XCII. and XCIII. with the forceps in Plate LXXXIX. fig. 2. We lay hold of the head of the child when the mother is much enfeebled, and the contraction of the uterus not ſufficient to expel the child in the uſual way: And when delivery cannot be effected even in this manner, or by turning the child and bringing it away by the feet, as ſome-

times happens from the pelvis being much diſtorted, we employ the crotchet repreſented in Plate XC. fig. 1. for bringing the child away piece-meal, after leſſening the ſize of the head by an opening made in the ſkull for diſcharging the brain with the ſciſſars repreſented in fig. 2. of the ſame Plate.

The neceſſity, however, of uſing any of theſe inſtruments I believe to be a rare occurrence: they are indeed frequently employed; but this proceeds in a great meaſure from impatience on the part of practitioners, who often force the delivery of the child, when Nature, if left to herſelf, would effect it in a much more eaſy manner. This fact is ſo certainly well-founded, and is of ſuch general importance, that practitioners of every deſcription, and more eſpecially thoſe who are newly entering on buſineſs, ſhould never loſe ſight of it. By not meeting with that attention which it merits, both the forceps and crotchet are daily employed with two much freedom, to

the

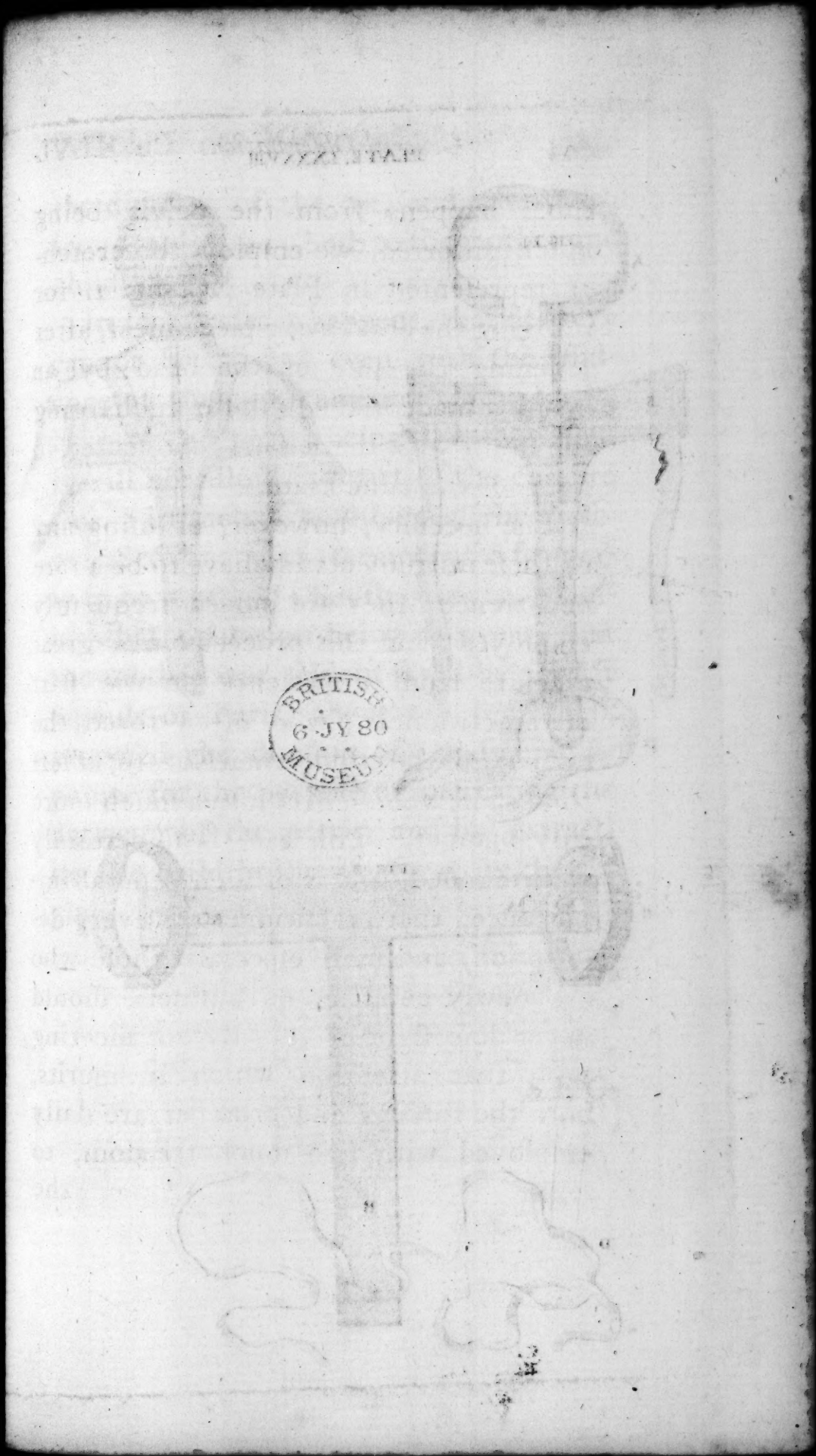

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PLATE. LXXXVIII.

FIG. 1.

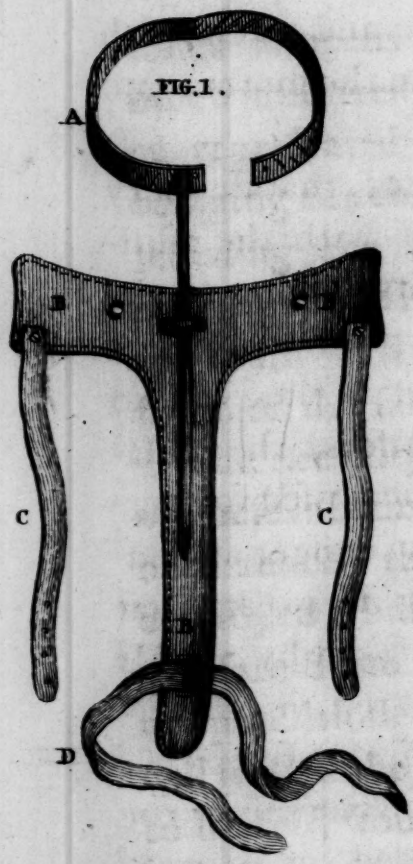


FIG. 2.

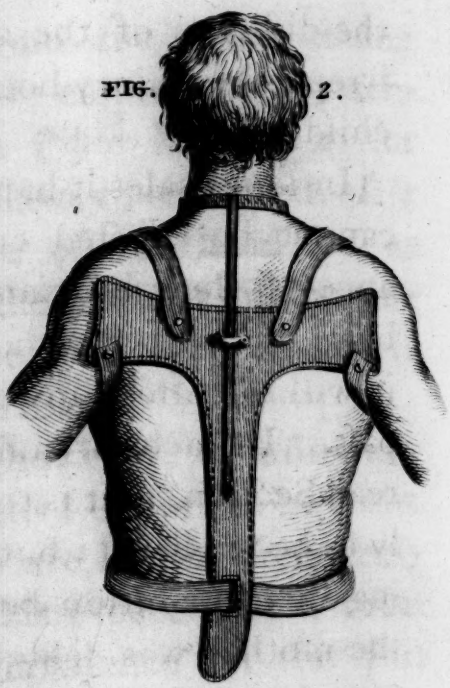
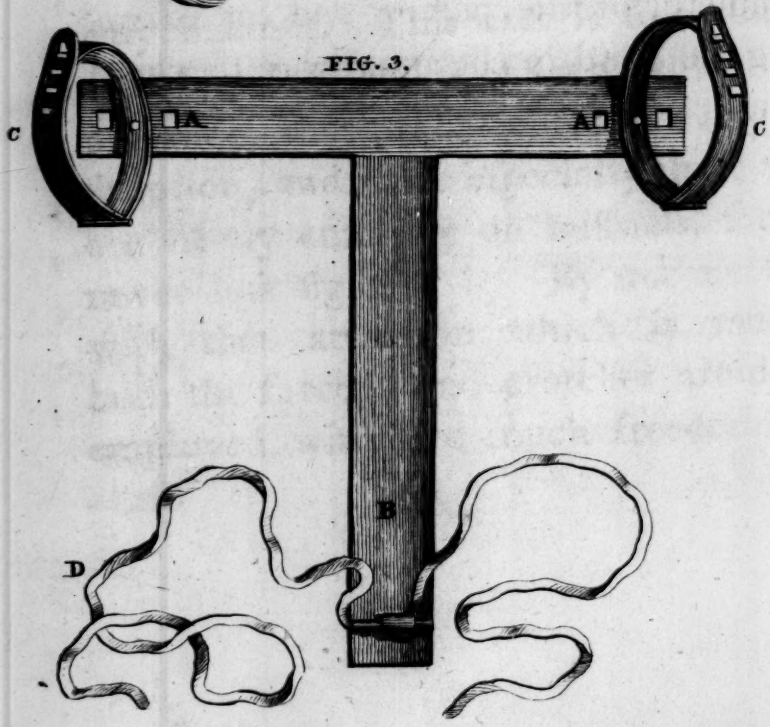


FIG. 3.



the diſgrace of the art, and often with irreparable injury both to the mother and child.

In ſome caſes it happens, that delivery cannot be effected even with the aſſiſtance of theſe inſtruments, owing to the brim of the pelvis being ſo narrow that it will not allow any part of the child to paſs. In ſuch circumſtances, the Cæſarean Section, as it is termed, uſed formerly to be practiſed; but the danger attending that operation being ſo great, that the mother was ſeldom ſaved by it, Mr Sigault of Paris, about ten years ago, propoſed the diviſion of the ſymphyſis pubis, for the purpoſe of increaſing the diameter of the pelvis, and for extracting the child in the uſual way by the vagina.

SECTION II.

Of the Cæſarean Operation.

THIS operation may become neceſſary, as we have ſeen in the laſt Section, by the brim of the pelvis being ſo narrow that it will not allow the child to paſs; and it may alſo become proper where the child has been forced into the cavity of the abdomen by a rupture in the uterus, as ſometimes happens from the uterus contracting with too much force before the os tincæ is ſufficiently dilated.

The Cæſarean ſection may be performed either with a view to ſave both the mother and child, when it is found that the child cannot be extracted in any other manner; to ſave the mother only when we know that the child is dead; or to

ſave

ſave the child immediately after the death of the mother.

As there are few inſtances of the mother being ſaved by this operation, ſome have adviſed that it ſhould never be performed till after the death of the mother. I am clearly of opinion that an operation attended with ſo much hazard ſhould never be adviſed as long as there is the leaſt reaſon to hope that delivery may be effected in any other manner: but I alſo think, that it is the duty of every practitioner to propoſe it when this cannot be accompliſhed; for it is ſurely better to afford the ſmall chance to the mother which accrues from it, than to leave her to a certain proſpect of death; while by the ſame means we may be enabled to ſave the child, which otherwiſe would be deſtroyed. None will heſitate in adviſing it after the death of the mother, when the child is found to be living. The following is the method of performing it.

The patient ſhould be placed upon a

table of the uſual height, and laid upon her back, her hands and legs being properly ſecured by aſſiſtants; her head ſhould be moderately elevated with pillows, and her thighs ſomewhat raiſed, in order to relax the abdominal muſcles. The operator ſtanding on one ſide of the table, is with a common round-edged ſcalpel to make an inciſion, ſix inches in length, through the ſkin and cellular ſubſtance, on one ſide of the abdomen: The cut ſhould commence two inches above the umbilicus on the outer edge of the rectus muſcle, and from thence ſhould be carried in a perpendicular direction downwards. The uterus is now to be laid bare, by carrying the inciſion through the tendinous parts of the abdominal muſcles and peritonæum; and this being done, an opening of the ſame length muſt be made in the uterus itſelf. The eaſieſt method of effecting this is, to make a ſmall opening with the ſcalpel ſufficient to admit the finger, which ſerves as a conductor to a probe-pointed biſtoury,

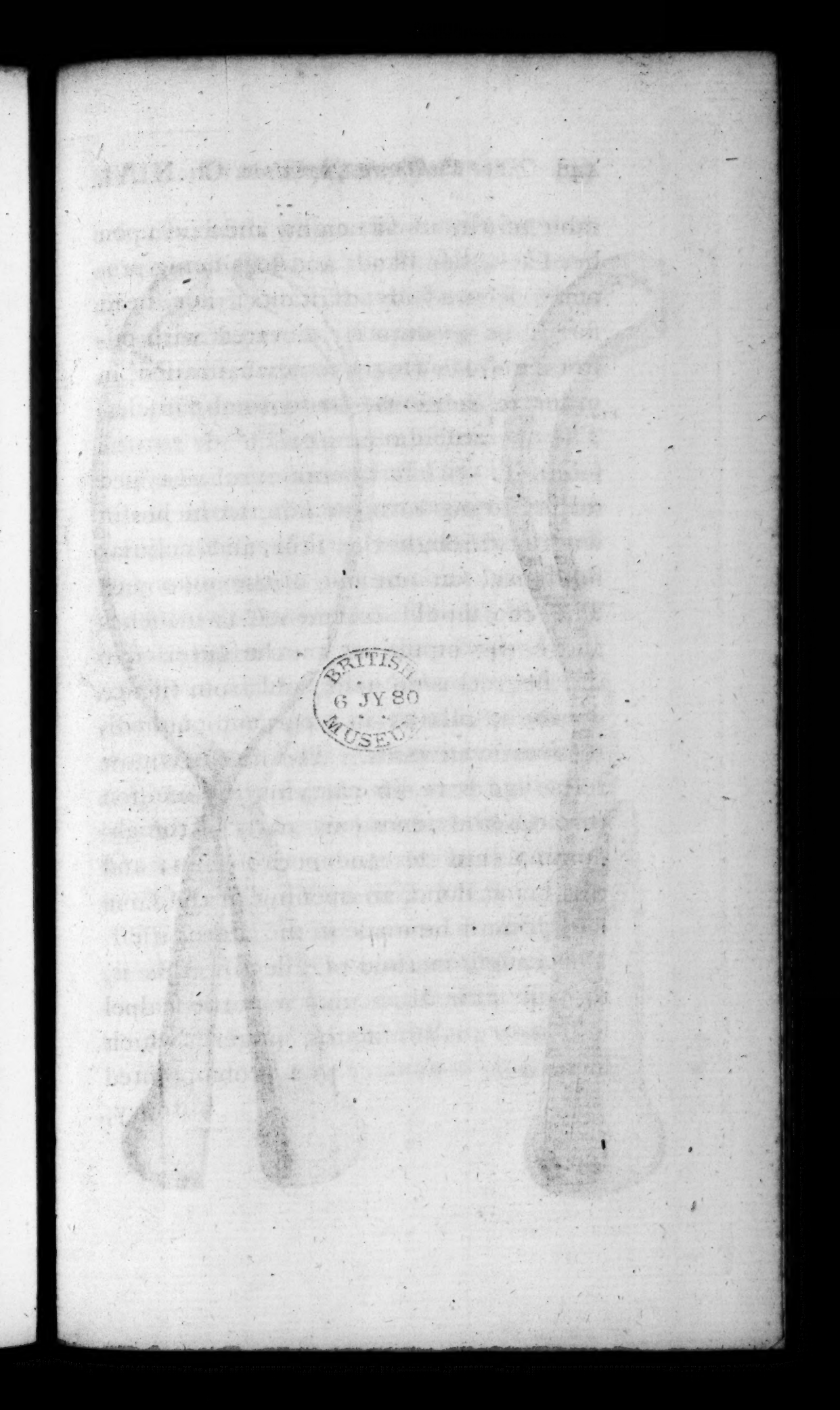

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PLATE. LXXXIX.

FIG. 1.



FIG. 2.



biſtoury, with which the remaining part of the inciſion ſhould be finiſhed. I may alſo remark, that the biſtoury inſerted upon the finger, at an opening made for the purpoſe, is the beſt method of dividing the peritonæum and tendinous aponeuroſis of the abdominal muſcles.

If any large blood-veſſel is cut in dividing either the external parts or the uterus, it ſhould be immediately tied with a ligature of a ſufficient length to hang out at the wound. The child muſt now be taken out; the placenta, and any effuſed blood that may have eſcaped during the operation, being alſo removed; and the inteſtines, if they have protruded, being replaced; the external opening ſhould be ſecured with three or four ſutures, in the manner we have adviſed in Chapter. XXXVI. Sect. XII. § 3.

The wound being covered with a pledgit of any emollient ointment, the abdomen ſhould be ſupported with ſeveral turns of a broad flannel roller; when the

patient ſhould be carried to bed, and ſtrictly enjoined to avoid ſpeaking and every kind of exertion.

Various cauſes concur to render this a very dangerous operation: Of theſe, the extenſive expoſure of the abdominal viſcera, and hemorrhagies from the uterus, are the moſt material. Any protruſion, therefore, which occurs of the bowels ſhould be immediately replaced, and no veſſel of any importance that may be cut in the diviſion of the uterus ſhould be left untied: It is not adviſed by writers upon this ſubject, but I ſee no harm that can enſue from it. If the ligatures are applied with the tenaculum, they will ſoon ſeparate; and by hanging out at the external wound, they may at any time be pulled away. It may be remarked, that it is internal hemorrhagies only that we have to dread, I mean ſuch as occur from the veſſels of the uterus: for, by carrying the inciſion on the outer edge of the rectus muſcle, we avoid the epigaſtric artery; the only veſſel of im-

importance that runs any riſk of being hurt in the diviſion of the teguments and muſcles.

In order to avoid the riſk of hemorrhagies from the uterus, ſome have adviſed the inciſion never to be made at that part where the placenta adheres; while, by others, we are directed to make the opening into the uterus exactly in a longitudinal direction, by which we are told that the principal veſſels with which it is ſupplied will moſt readily be avoided. No advantage, however, is derived from this in practice: for the inciſion in the uterus muſt correſpond exactly with the external inciſion; which cannot with propriety be made in any other direction than the one we have mentioned. Beſides, it would often be impoſſible to diſtinguiſh the part at which the placenta adheres: nor is there much ground to ſuppoſe that the hemorrhagy from the uterus depends ſo much upon the direction as on the extent of the inciſion; and it ought not to be leſs than

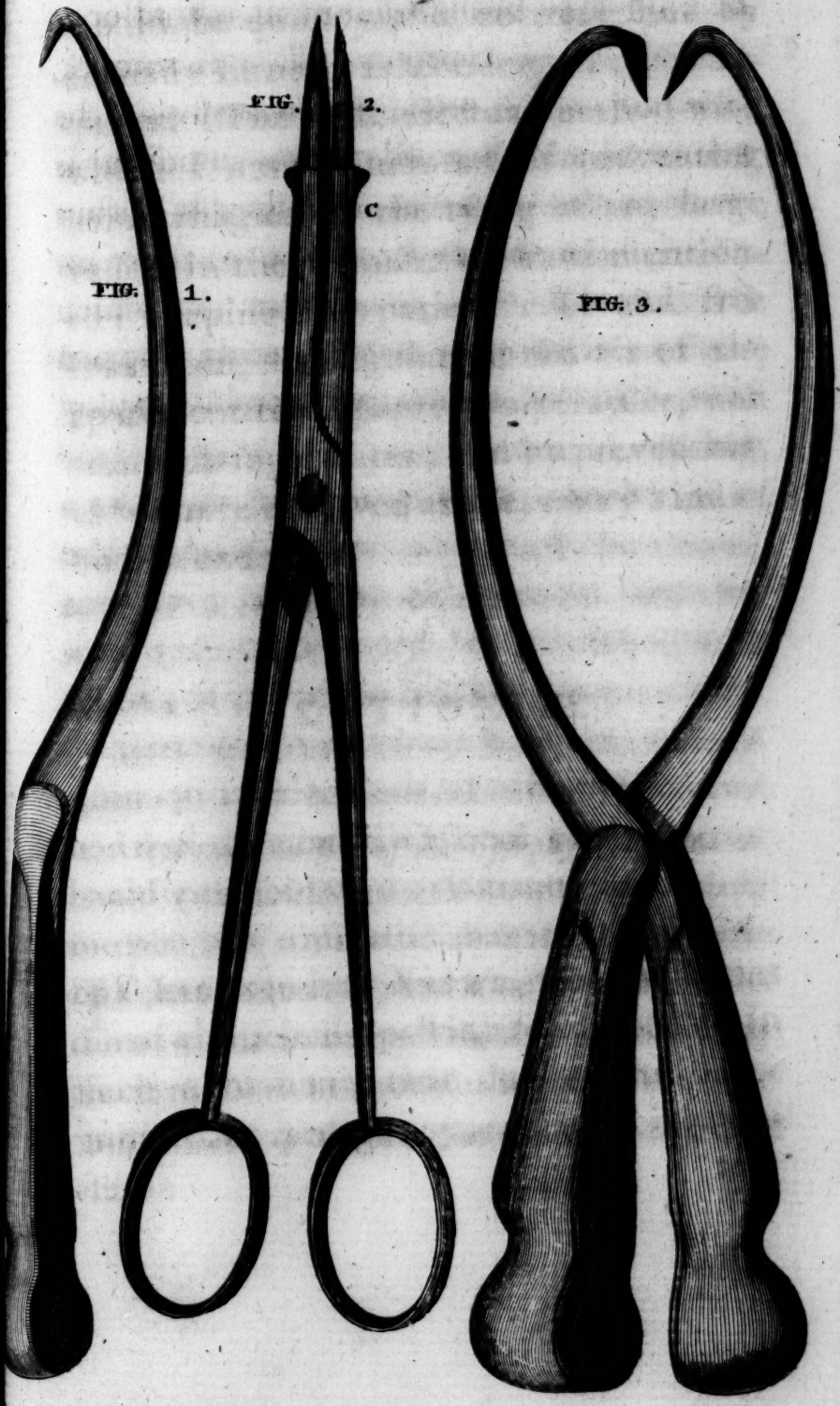
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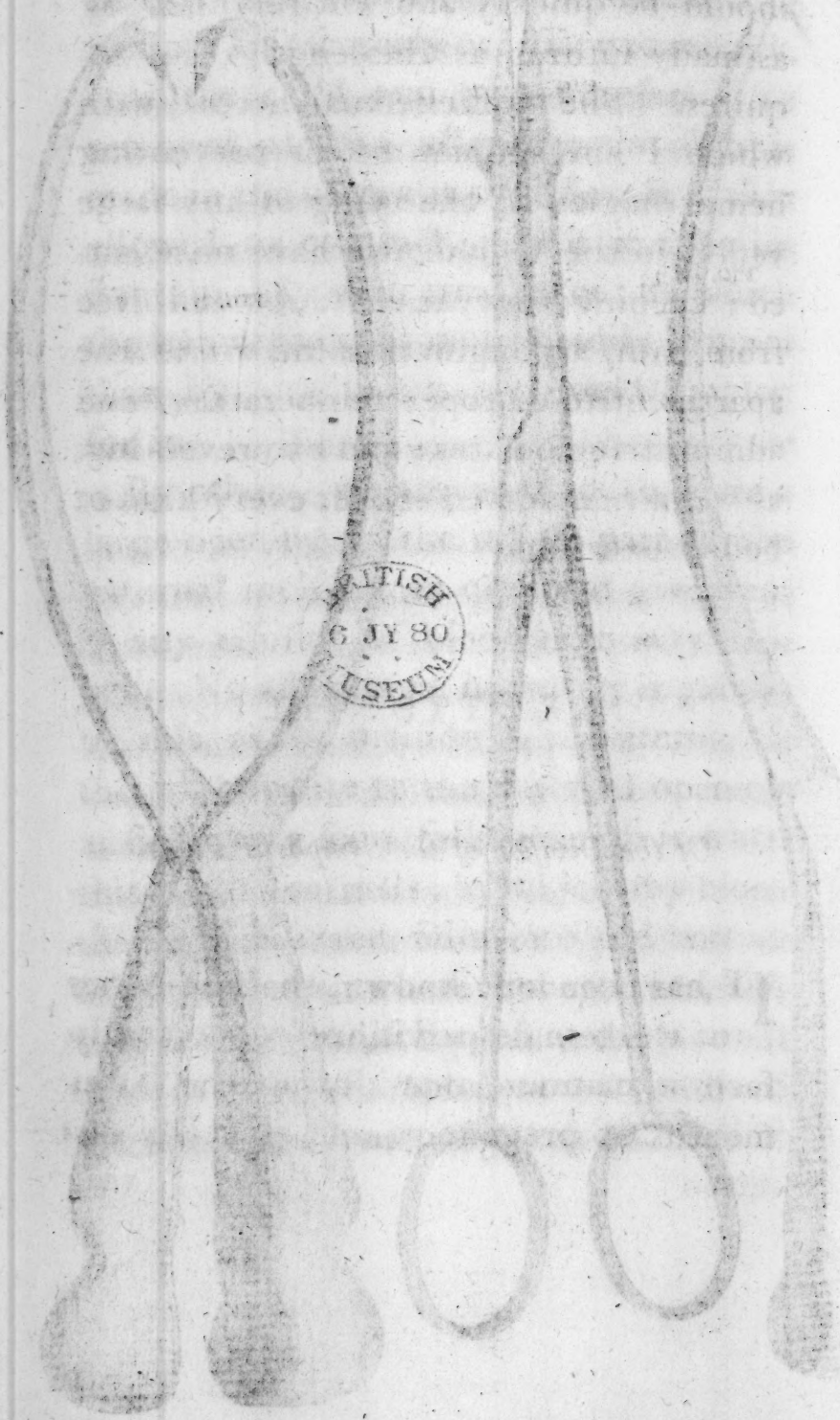
ſix inches in length, as the child could not be extracted with freedom at a ſmaller opening. It is ſcarcely neceſſary to remark, that the child and placenta ſhould be removed as ſoon after the inciſion is made in the uterus as poſſible: It is thus allowed to contract, which it does inſtantaneouſly with great force; by which the hemorrhagy is more readily ſtopped than by any means we could employ for it.

By others, we are adviſed to leave a large opening at the under part of the external inciſion, in order to give vent to any effuſion of blood that may happen. No advantage, however, is gained by this, as the inciſion in the uterus, although oppoſite to the external opening at firſt, very ſoon falls beneath it when this viſcus contracts; by which any blood that is diſcharged falls into the bottom of the abdomen where it coagulates, and thus cannot be diſcharged at the wound. And as it is of importance to prevent the air as much as poſſible from finding

acceſs

PLATE. XC.




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acceſs to the abdomen, the external cut ſhould be quickly and entirely ſhut by as many ſutures as the length of it requires. The moſt effectual method with which I am acquainted of preventing hemorrhagies is, the tying of any large veſſels in the manner we have mentioned; keeping the patient cool and free from pain, by regulating the air of the apartment to a proper temperature, and adminiſtring opiates; and by preventing, as we have obſerved above, every kind of bodily exertion.

SECTION III.

Of the Diviſion of the Symphyſis Pubis.

IT has been long known, that the bones of the female pelvis are connected in ſuch a manner, that during the latter months of pregnancy, and eſpecialy during

ring labour, they are ſeparated in ſome degree from each other; by which the paſſage of the child is rendered much eaſier than it otherwiſe would be. It was a knowledge of this fact, and the great danger attending the Cæſarean operation, which firſt ſuggeſted the idea of dividing the bones of the pubis at their junction with each other in caſes of narrow pelvis. It was propoſed upwards of two hundred years ago, by a French ſurgeon of the name of Pineau; but Mr Sigault of Paris was the firſt who had the merit of putting it in practice, in the year 1777.

The operation is eaſily performed. The patient muſt be laid upon her back on a table of a convenient height; the pelvis ſhould be elevated with two or three pillows put beneath it, and the legs and arms ſhould be ſecured by aſſiſtants. When in this ſituation, the bladder ſhould be emptied by the introduction of a catheter, which ſhould be retained in the urethra by one of the aſſiſtants

till the diviſion of the bones is completed.

After ſhaving the pubis, the operator, ſtanding on one ſide of the patient, ſhould with a longitudinal inciſion divide the ſkin and cellular ſubſtance covering the pubes at their ſymphyſis: The cut ſhould commence at the upper edge of theſe bones, and be continued nearly, but not entirely, along their whole breadth: On the bones being laid bare, the cartilage by which they are joined muſt be ſlowly and cautiouſly divided; and as it is by no means hard, it is eaſily done. Both the teguments and cartilage may be divided with a firm round-edged ſcalpel of the common form, which is the only inſtrument except the catheter that is neceſſary in this operation. The intention of the catheter is, to point out the courſe of the urethra to the operator; for it lies ſo contiguous to the pubes at their ſymphyſis as to be in great danger of being cut, if this precaution be not attended to; even the bladder

bladder itſelf might be injured, were the diviſion of the cartilage not conducted with caution: but with due attention to theſe points, and avoiding the total diviſion of the ſoft parts at the under edge of the bones, all riſk of hurting either the bladder or urethra may be prevented.

On the diviſion of the cartilage being completed, the bones recede conſiderably from each other. To prevent any conſequences that might enſue from their ſeparating forcibly and ſuddenly, the aſſiſtants who have the charge of the thighs ſhould be deſired to ſupport them, particularly towards the end of the operation; and if a ſufficient opening is not gained in this manner, the thighs may afterwards be ſlowly and gradually ſeparated.

The child is now to be delivered in the uſual way by the vagina; and this being affected, and the placenta removed, the bones ſhould be immediately put together, and retained as exactly as poſſible

PLATE. XCI.

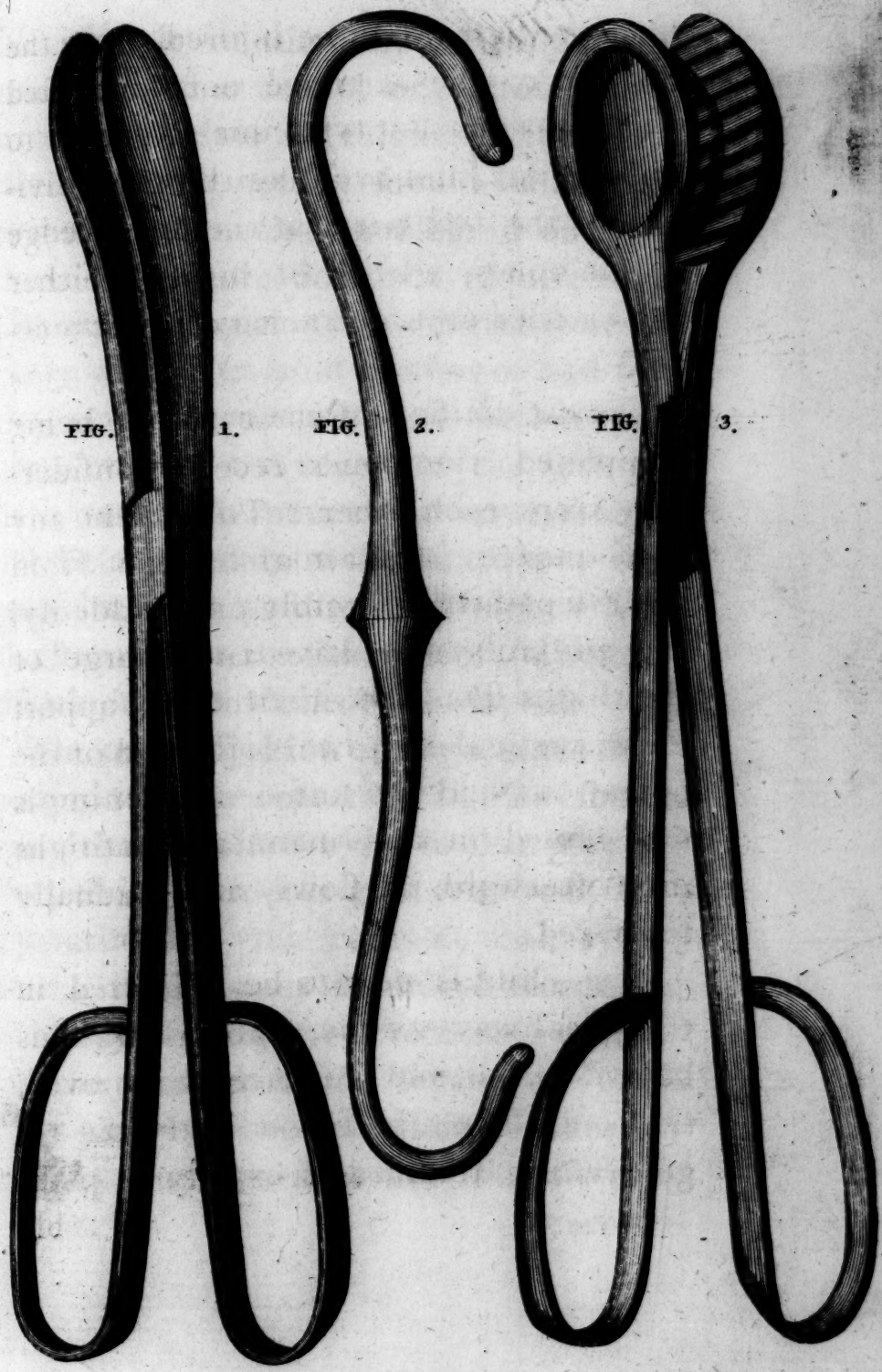
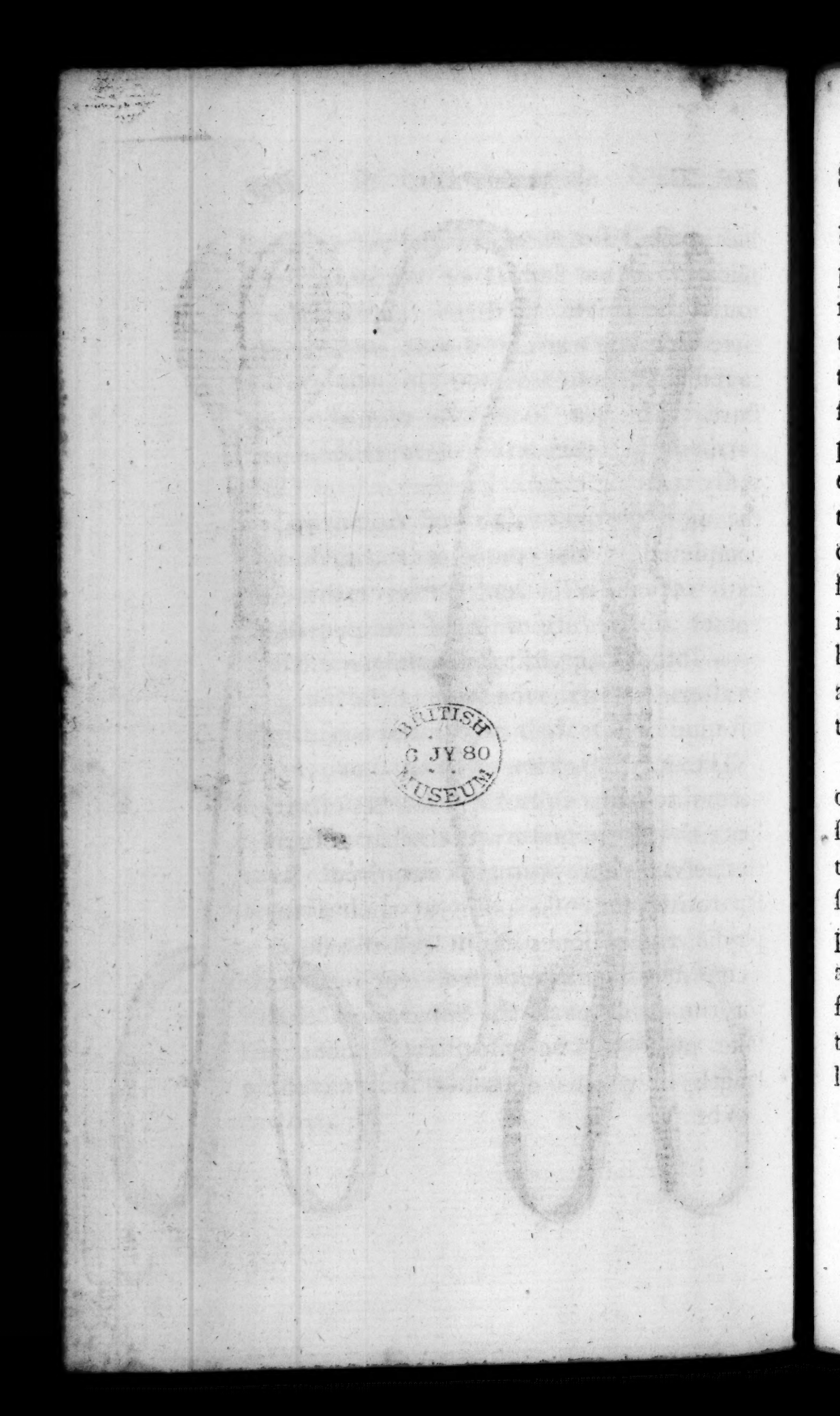


FIG. 1. FIG. 2. FIG. 3.


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ble in their ſituation, by the proper application of a flannel or cotton roller round the pelvis and thighs; at the ſame time that the patient ſhould be deſired to remain as much as poſſible in one poſture. The ſore does not require any particular attention; in general it heals eaſily with light mild dreſſings; and for the moſt part the union of the bones is completed in the courſe of the fifth or ſixth week. The patient, however, ſhould not be allowed to walk, or to put the body into any poſture that might effect an alteration in the ſituation of the bones, till nine or ten weeks have elapſed.

The only objection of importance that occurs to this operation is, the ſmall ſpace that is gained by it in that part of the pelvis where it is moſt required. By ſeparating the oſſa pubis at their ſymphyſis, theſe bones do indeed recede to a conſiderable diſtance from each other; for the moſt part, the ſeparation that takes place will be at leaſt two inches in length: but this does not increaſe the

narrow diameter of the pelvis; that is, the bones of the pubis will ſtill remain at nearly the ſame diſtance from the os ſacrum as before the operation; and in almoſt every inſtance of difficult labour from mal-conformation of the pelvis, we find it proceeding entirely from the oſſa pubis and os ſacrum being too near to each other. It may often happen, however, that the head of the child may be ſo ſituated, that even this ſeparation of the oſſa pubis alone may allow it to paſs, when otherwiſe it would have remained entirely above the brim of the pelvis; and as we do not find that the operation is in any reſpect hazardous, for in different inſtances it has been done more than once on the ſame perſon, it ſhould always be adviſed, when we are convinced that the pelvis is ſo narrow that the child cannot poſſibly paſs through it. It ſhould always be adviſed in preference to the Cæſarean operation.

If farther experience ſhall ſhow, that in all caſes of narrow pelvis, the child may

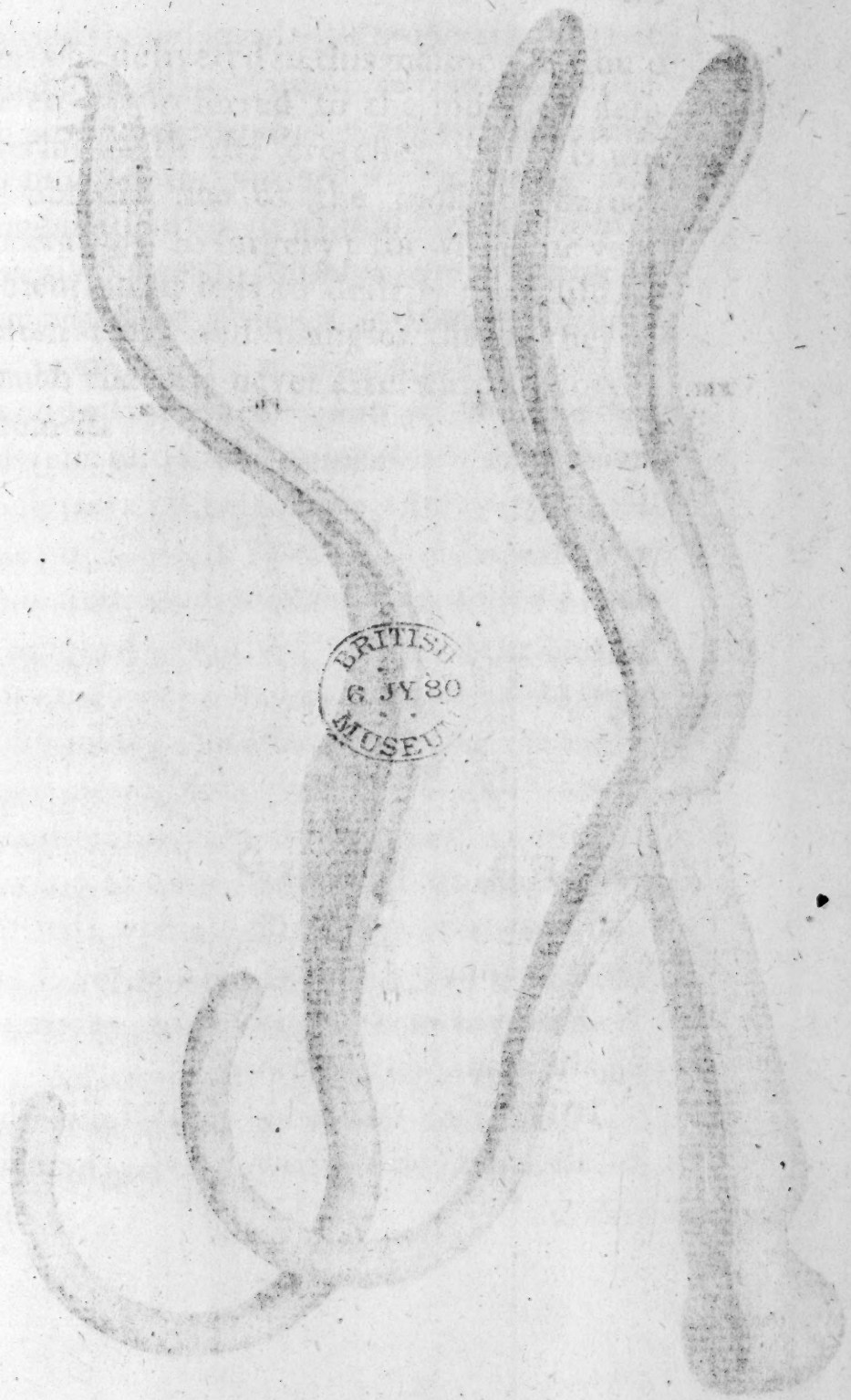

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PLATE. XCII.

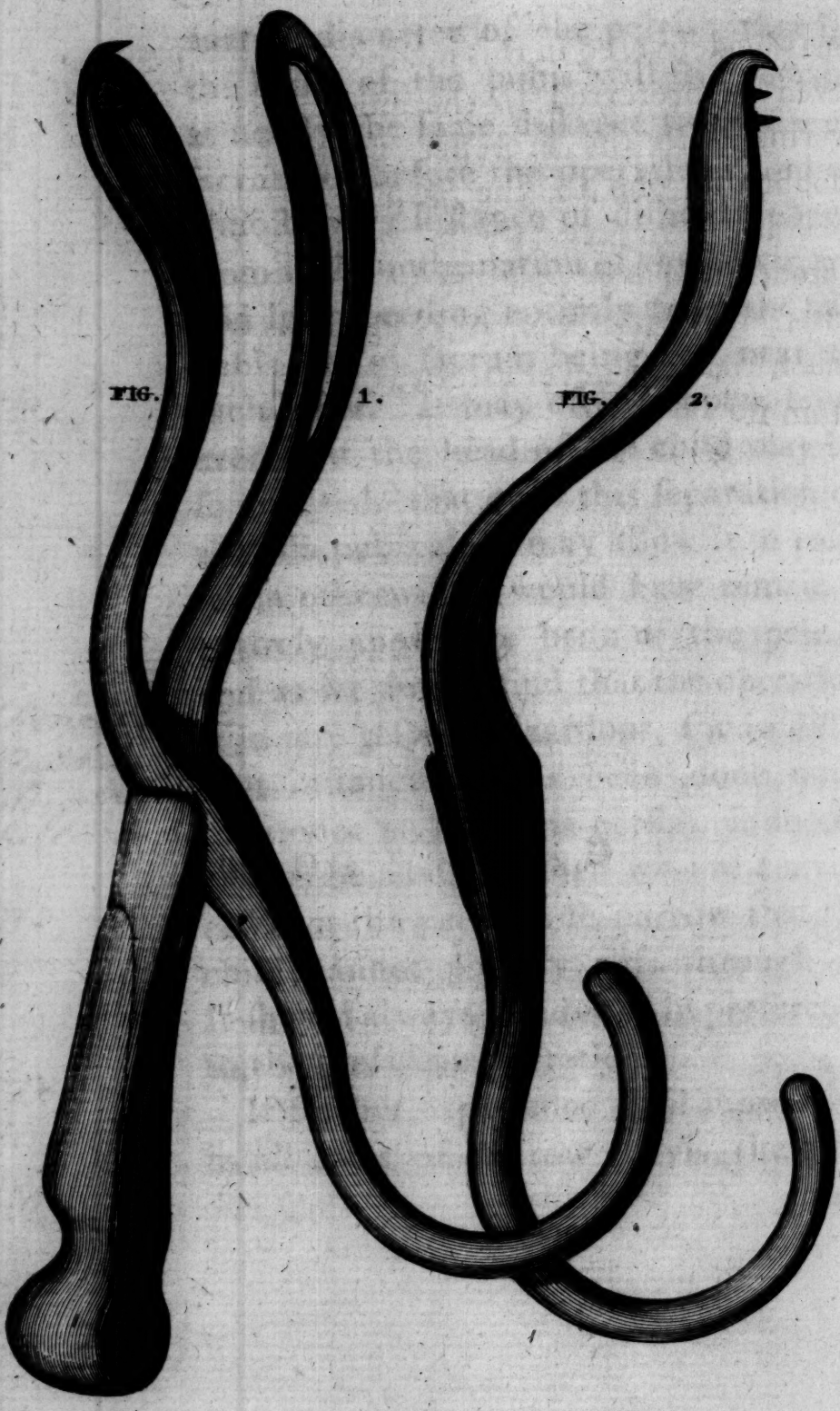


FIG. 1.

FIG. 2.

may be delivered in this manner, it ſhould even be preferred to the mode of delivering with the crotchet, which is undoubtedly one of the moſt barbarous operations in ſurgery; for while the very intention of it is to deſtroy the child, it often tears and mangles the mother ſo much that ſhe never afterwards recovers from it.

CHAP. XLVII.

Of Opening Dead Bodies.

WITH a view to diſcover the ſeat and cauſes of diſeaſes, and at the inſtance of the civil magiſtrate in caſes of violent death, ſurgeons are employed to open dead bodies. To do this with accuracy every preternatural appearance ſhould be committed to paper. After noting any external marks of diſeaſe, we proceed to examine the ſtate of the different cavities and of their contents. When the diſorder has been ſeated in one cavity, we do not open the others; but when

when they are all to be examined, it is proper to begin with the head.

The body being placed upon a table of a convenient height, and the head firmly fixed by an aſſiſtant, an inciſion ſhould be made from ear to ear acroſs the parietal bones. The ſcalp is now to be diſſected from the parts beneath; and one half being turned backward and the other over the face, a common amputating ſaw muſt be uſed for dividing the cranium: The diviſion may be begun on the os frontis immediately above the frontal ſinuſes, and muſt afterwards be continued backward through the parietal bones and os occipitis. The upper part of the ſkull is now to be raiſed with a levator; by this means the dura mater may be freely examined; and if we wiſh to go to the depth of the ventricles only, in order to diſcover whether any preternatural quantity of ſerum be collected in them, this may be done without removing the brain. But when our object is to examine the ſtate of the

brain and cerebellum, they muſt both be removed and examined at leiſure. This being done, and all the extravaſated blood taken off with a ſponge, the brain and cerebellum muſt be replaced with the ſkull-cap above them. The two portions of ſcalp are now to be drawn over the whole, and ſecured in their ſituation by ſewing the edges of the cut together from one end to the other, either with the glover's ſtitch, or in any other way which the operator may prefer. For this purpoſe narrow tape is uſually employed, and a large curved needle with a triangular point.

The cavities of the thorax and abdomen are moſt effectually expoſed in the following manner: Let an inciſion be made through the common teguments from the top of the ſternum to the umbilicus, and let it be continued on each ſide through the abdominal muſcles, from the umbilicus to the top of the os ileum: The teguments and muſcles muſt now be diſſected from the thorax, till

PLATE. XCIII.

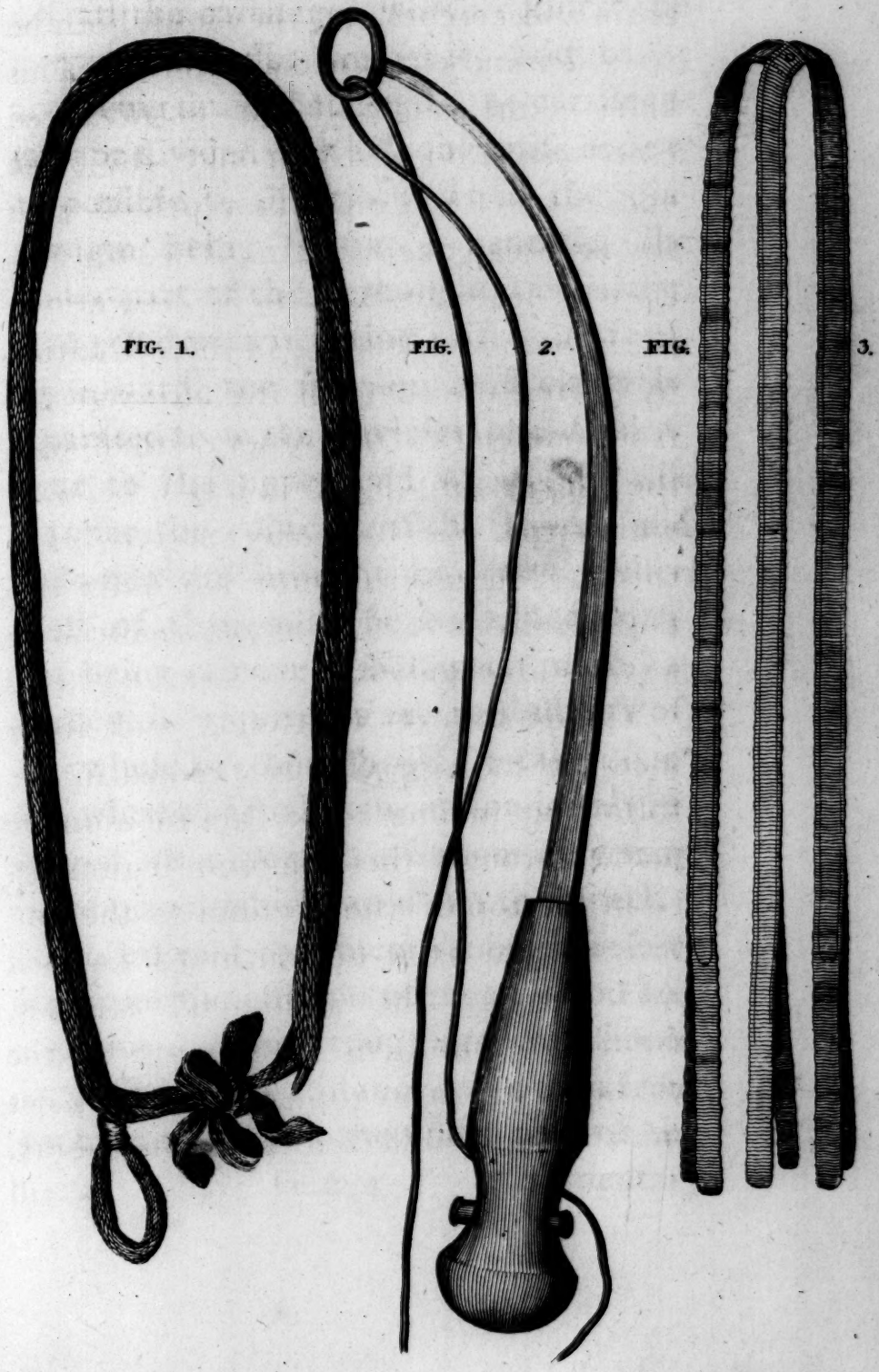
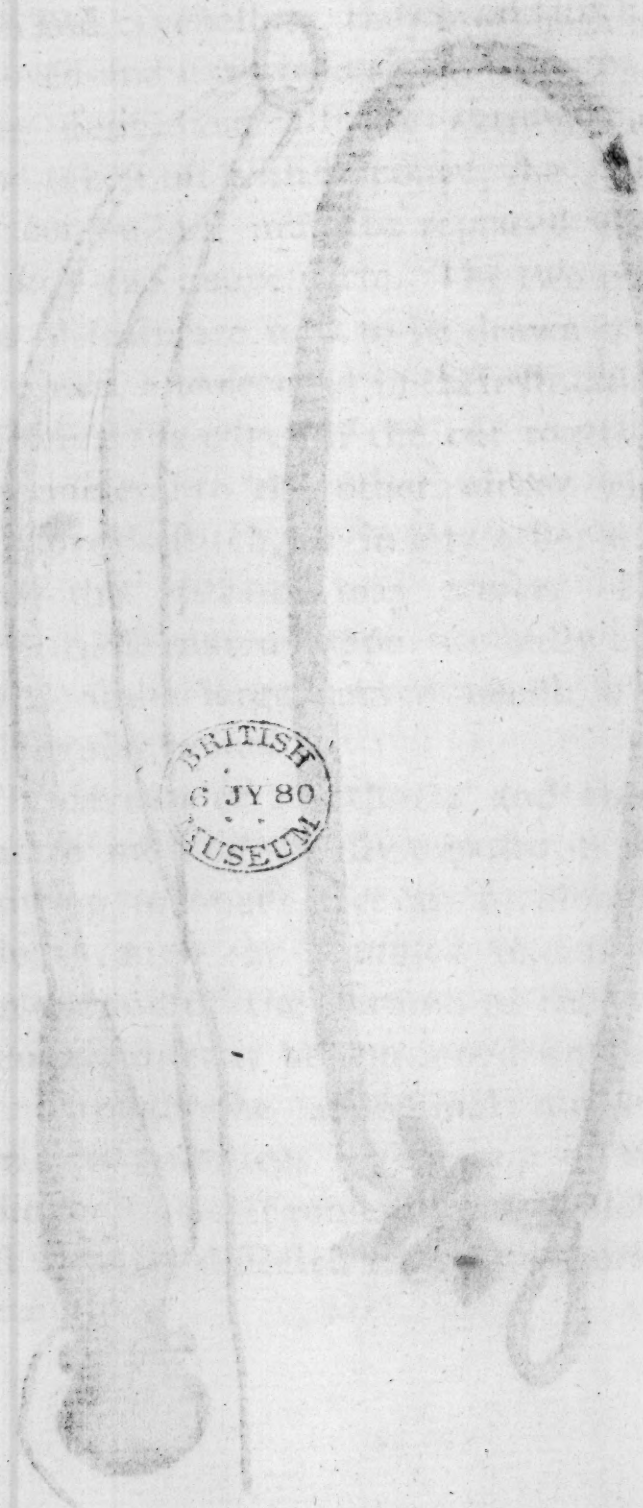


FIG. 1.

FIG. 2.

FIG. 3.


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till all the cartilages which connect the ſternum and ribs are freely laid bare; and being drawn backward, the cartilages muſt be divided with a ſtrong knife as near as poſſible to the ribs; when the diaphragm being ſeparated beneath, the under part of the ſternum and cartilages connected with it, being raiſed and turned upward, the ſternum muſt either be ſeparated from the clavicles, or cut acroſs near to the upper end of it. In this manner the contents of the thorax and abdomen are brought into view, when moſt of them may be examined without being removed; but when more accuracy is required than this admits of, the whole of them ſhould be taken out: Or, when a partial examination is only required, that portion of them only may be removed which we mean to inſpect.

To prevent the inconvenience reſulting from the effuſion of much blood and excrement, two ſtrong ligatures ſhould be paſſed at the diſtance of an inch from each other round the under part of the

alimentary canal and large contiguous blood-veſſels, and round the trachea, œſophagus, and large blood-veſſels of the neck. The parts between the upper and under ligatures being divided, the whole viſcera of both the cavities may then be eaſily removed, by diſſecting them from the contiguous parts, and raiſing them up as we go along.

The neceſſary examination being finiſhed, the effuſed blood all waſhed off with a ſponge, and the viſcera replaced, the teguments muſt be drawn over them, and ſtitched together with as much neatneſs as poſſible.

In opening bodies that have died of any diſeaſe, the operator ſhould be as cautious as poſſible in avoiding cuts or ſcratches of his fingers and hands: Various inſtances have occurred of much diſtreſs being induced; and in ſome caſes even death has enſued, from inattention to this circumſtance.

CHAP.

CHAP. XLVIII.

Of EMBALMING.

IN former times, embalming was practiſed with more care and attention than it is now. This was a neceſſary conſequence of the deſire which then prevailed, of preſerving dead bodies for ages. at preſent it is ſeldom employed, except for the purpoſe of preventing bodies from putrefying during the ſhort ſpace which elapſes between the death and burial of the perſon; and not even with this view, if the corps be not to be kept longer than is uſually done in private life. The following is the preſent method of em-

embalming. The brain, and all the viſcera of the thorax and abdomen, being removed in the manner we have mentioned, in the laſt Chapter, they are all, excepting the heart, put into a leaden box with a conſiderable quantity of an aromatic anteſeptic powder, prepared with myrrh, frankincenſe, cloves, the leaves of lavender, roſemary, mint, ſage, and other ſimilar articles; and to theſe are added a proportion of any odoriferous oils. The blood being removed from the different cavities, and the heart replaced, they are all filled with the ſame kind of powder, with a due proportion of odoriferous oils or ſpirits, and the parts afterwards ſowed up in the manner we have already adviſed. By ſome, too, the mouth and noſtrils are ſtuffed with theſe powders and oils; and inciſions are made into all the fleſhy parts of the body, which are alſo ſtuffed with them, and afterwards ſowed up: but there is no neceſſity for this, unleſs the body is to be kept for a great length of time, or to be carried to

a

a conſiderable diſtance. In which caſe, it is uſual, after ſtuffing the inciſions in the manner we have mentioned, to roll all the extremities, as well as the trunk of the body, firmly up with bandages, and to cover the whole with varniſh.

The body is now to be laid upon a cerecloth of a ſufficient ſize, which muſt be applied with as much neatneſs as poſſible to the head and every part of the body, and muſt either be firmly ſecured by ſowing or with tapes tied at proper diſtances. The cerecloth is made of linen dipped in a compoſition of wax, oil, and roſin; which ſhould be of ſuch a conſiſtence as to be ſufficiently pliable, without being ſo ſoft as to ſtick to the fingers of thoſe who apply it: It may be coloured with verdegris, red lead, or any other article according to the fancy of the operator. When two cerecloths are applied, one above another, they are uſually made of different colours.

The cerecloth being put on, it was formerly the cuſtom to employ a painter

to

to colour the face; but this is now very commonly omitted: the dreſs intended for the corps is immediately put on; and the body is either laid in the coffin, or allowed to be expoſed, according to circumſtances.

CHAP. XLIX.

Of BANDAGES.

BANDAGES are employed for various purpoſes in Surgery; for the retention of dreſſings; for ſtopping hemorhagies; for removing deformities; and for effecting the union of divided parts.

As a proper application of bandages is an object of much importance, it is a branch of the art which authors have not neglected: Many treatiſes have been publiſhed upon it; but unfortunately it cannot be taught by deſcription: Experience alone can give an adequate idea of

of it; nor is it poſſible to acquire it but by much manual practice. Hence, in the ſtudy of this part of ſurgery, more advantage is to be gained by practiſing upon a block, than by reading the moſt elaborate diſſertations. My only intention, therefore, at preſent is, to offer a few general obſervations upon bandages.

1. Bandages ſhould be formed of ſuch materials as are ſufficiently firm for effecting the purpoſe for which they are intended, at the ſame time that they may fit with eaſe upon the parts to which they are applied.

In ſome caſes a degree of firmneſs is required, which cannot be obtained from materials of a ſoft texture: Of this we have examples in the moſt part of truſſes for Herniæ, as well as in every bandage requiring much elaſticity: But for the moſt part bandages are made of linen, cotton, or flannel. Till of late, linen was univerſally uſed for this purpoſe; but later

experience has ſhown, that cotton and flannel are preferable. They abſorb moiſture more readily, whether it be produced by ſweat, or as the ordinary diſcharge of wounds or ſores, at the ſame time that they are better calculated by their elaſticity for yielding to the ſwelling which often takes place in luxations, fractures, and other injuries for which bandages are employed. Flannel was firſt uſed for this purpoſe in the Royal Infirmary here, about thirty years ago, by Mr James Rae of this place; and ſince that period the practice has been generally adopted. The objection made to the uſe of flannel for bandages, by ſome practitioners, of its not being ſo cleanly as linen, is frivolous: Neither of them will be cleanly if they be not frequently changed, while either of them will be ſufficiently ſo if this point be attended to.

2. Bandages ſhould be applied of a degree of tightneſs ſufficient for anſwering

ſwering the purpoſe for which they are intended, without incurring any riſk of their impeding the circulation, or doing harm in any other manner. No advantage will accrue from them if they be not ſufficiently tight to ſupport the parts affected; while ſwelling, inflammation, and even gangrene, will be apt to occur if they be too tightly applied.

3. Every bandage ſhould be applied in ſuch a manner, that it may be as eaſily looſened, and the parts examined with as much accuracy as poſſible. Thus in fractures of the thigh and leg, where the limb cannot with propriety be frequently raiſed, we now prefer univerſally the bandage with twelve or eighteen tails to the common roller. The former can be undone and fixed at pleaſure without moving the limb, while a roller can neither be applied nor removed without raiſing every part of the limb to a conſiderable height.

4. Bandages ſhould always be laid aſide as ſoon as the purpoſe for which they

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PLATE XCIV.

FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.



FIG. 5.



FIG. 6.



they are intended is accompliſhed. This being obtained, no advantage can accrue from them, and they often do harm by impeding the growth of the parts upon which they are applied.

5. We have found it neceſſary in the courſe of this work to mention bandages for many parts of the body. In ſpeaking farther of bandages for particular parts, we ſhall begin with the head, and proceed downwards to the trunk of the body and extremities. One of the beſt bandages for all the upper and back parts of the head, for the fore-head, ears, and temples, is a night-cap, with one band to tie it before, and another beneath the chin, as is repreſented in Plate XCIV. fig. 1. The Couvre-chef of the French, repreſented in fig. 2. is moſt frequently uſed for theſe parts; but it can neither be applied with ſuch firmneſs or neatneſs as the night-cap.

For the purpoſe of making compreſſion on any particular part of the head,

the Radiated Bandage, as it is termed, may be employed, as is repreſented in Plate XCIV. fig. 3. It may alſo be uſed for compreſſing the temporal artery: but for this purpoſe the machine repreſented in Plate VII. fig. 3. anſwers better.

In longitudinal cuts of the head, the Uniting Bandage, as it is termed, may be uſed with advantage. It is formed of a long roller with two heads, with a ſlit or opening in the middle, as is repreſented in Plate XCV. fig. 3. The ſides of the cut being drawn neatly together, and covered with a pledgit of any ſimple ointment, the cure is to be effected by means of this bandage, applied in the manner repreſented in fig. 6. of the ſame Plate. In cuts of this deſcription, their edges may ſometimes be retained together with ſufficient exactneſs by this bandage; and when this can be done, it will always be preferred to the mode of doing it by ſutures.

When it is neceſſary to retain dreſſings

ſings upon the eyes, it has uſually been done by placing a compreſs over them, and retaining it by ſeveral turns of a long roller, ſuch as is repreſented in Plate XCV. fig. 1. This bandage, when employed for one eye, is the Monoculus of authors, and it is termed Binoculus when applied to both eyes. But as a roller paſſed round the head is apt to ſlip, even when applied in the moſt exact manner, thecouvre-chef in Plate. XCIV. fig. 2. or the night-cap in the ſame Plate fig. 1. are by many preferred for retaining the compreſſes.

In fractures and cuts of the noſe, the dreſſings are beſt retained by a proper application of the uniting bandage in Plate XCV. fig. 3. and a proper application of the ſame bandage anſwers beſt in longitudinal cuts of either of the lips.

In fractures of the lower jaw, we employ a four-headed roller, ſuch as is repreſented in Plate XCV. fig. 4. The ſpace left entire between the four-heads at A, is applied to the chin, the hole in the centre of it being meant to receive

the apex of the chin. The two ſuperior heads are then carried backwards; and being made to paſs each other at the occiput, they are afterwards brought forward over the os frontis: they may either be fixed there, or again reflected back and fixed with pins on the ſides or back-parts of the head. The two under heads of the roller being reflected over the chin, are then to be turned upwards, and either tied or pinned on the top of the head; or before fixing them, they may be made to paſs each other two or three times. Various other bandages are deſcribed by authors for the head; but thoſe we have mentioned, with a proper application of the common roller, Plate XCV. fig. 1. for particular purpoſes, are all that can be ever required.

6. In Plate XXIII. fig. 1. an inſtrument is delineated for one of the moſt material operations upon the neck, Bronchotomy; and in Plate LXVI. fig. 1. another is repreſented for the wry neck;

PLATE. XCV.

FIG. 1.

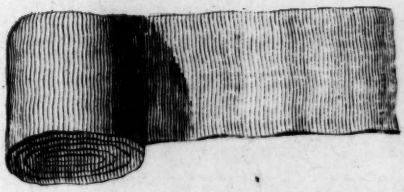


FIG. 2.

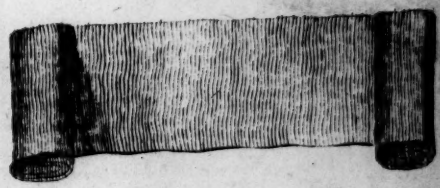


FIG. 3.

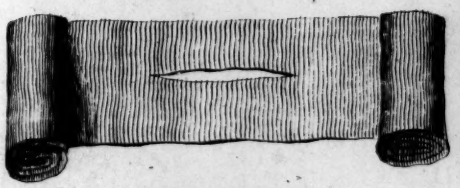


FIG. 4.

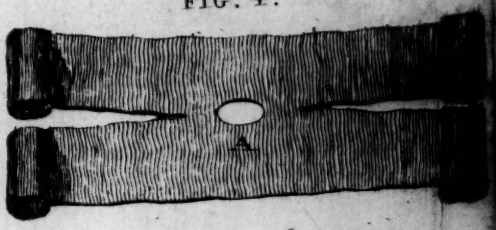


FIG. 5.

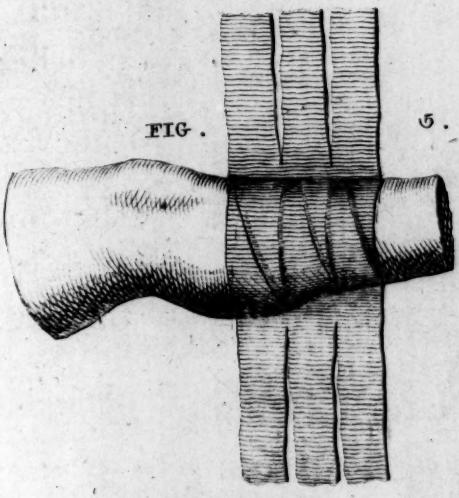


FIG. 6.

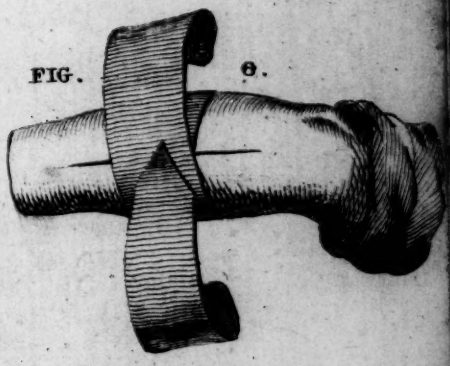
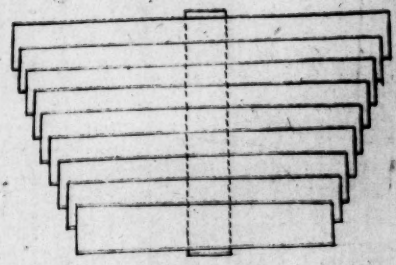


FIG. 7.



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A common roller may be made to anſwer every other purpoſe that can be required of a bandage in any part of the neck.

7. A variety of bandages are uſed for affections of the ſhoulders and contiguous parts, particularly for fractures of the ſcapula, and fractures and luxations of the clavicle. In fractures of the ſcapula, a proper application of a long roller may, in moſt inſtances, prove uſeful; but in Chapters XXXIX. Section V. we have ſhown, that no utility is derived from bandages in fractures of the clavicles: They cannot be applied with ſuch tightneſs as to compreſs the fractured bone without impeding reſpiration; and beſides, we do not find that they are neceſſary, when the arm of the affected ſide is properly ſupported by the ſling, Plate LXXXI.

8. The moſt uſeful of all bandages for the thorax and abdomen, at leaſt for the retention of dreſſings on any of thoſe parts, is that which we uſually term the

Napkin and Scapulary, repreſented in Plate XCVI. fig. 1. That part of it which goes round the body A, is termed the Napkin. When it is applied for making preſſure upon a fractured rib, it ſhould be in the form of a roller, and ſhould paſs two or three time sround the body; when it is only uſed for retaining dreſſings, it ſhould not go more than once round: It ſhould be ſix or ſeven inches broad for an adult; and it ſhould be ſecured by pieces of tape, tying it at each end inſtead of pins. The Scapulary BB, conſiſts of a ſlip of linen, cotton, or flannel, about three inches broad, and of a length ſufficient to reach from the upper part of the napkin behind, to paſs over the ſhoulders and be pinned to it before: It is ſometimes made with a hole in the centre of it for paſſing over the head; but it anſwers better to divide the anterior end of it by a longitudinal ſlit into two, and in applying it to make one of theſe ſlips paſs on each ſide of the head.

This

PLATE XCVI.

FIG. 1.

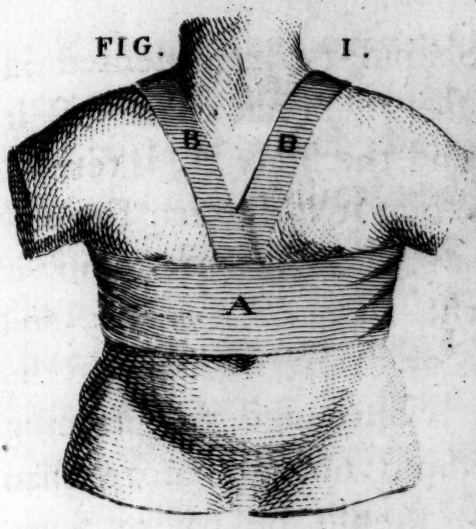
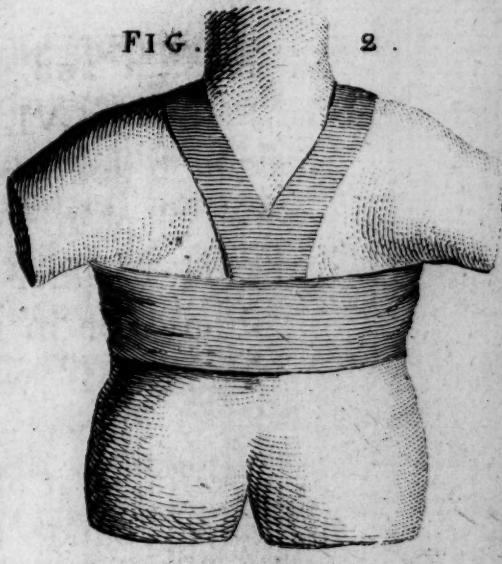


FIG. 2.



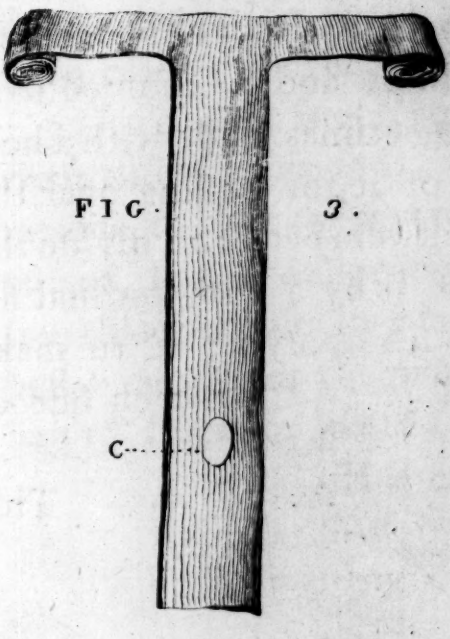


FIG. 3.

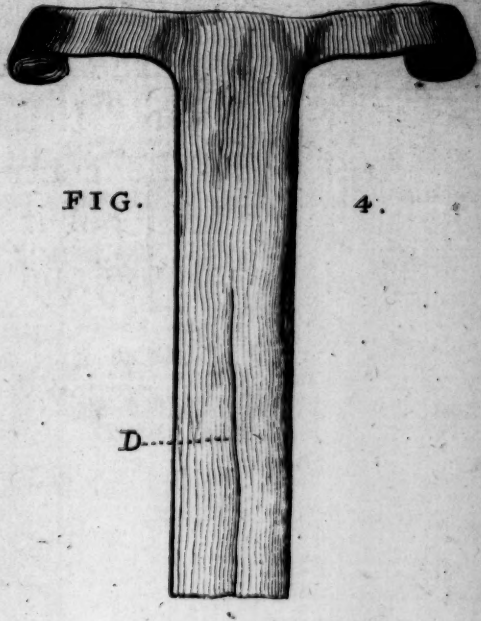


FIG. 4.

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This bandage anſwers the purpoſe better than any other for making preſſure on the parts at which the viſcera protrude, in caſes of umbilical and ventral herniæ. As in ſuch caſes it is a point of much importance to have the bandage firmly fixed, we not only employ the ſcapulary for preventing it from ſlipping down, but a ſtrap connected with it behind is paſſed between the thighs and pinned to it before to prevent it from ſlipping up.

In Plate XXII. fig. 2. a bandage is repreſented for compreſſing the abdomen in the operation of tapping; and in Plate VIII. different bandages are delineated, or Truſſes as they are termed, for the retention of the protruded viſcera in caſes of herniæ.

9. As it is of much importance in various diſeaſes, as well as in ſeveral operations, to have the ſcrotum properly ſupported, I have delineated ſome bandages for this purpoſe in Plate XCVII. The beſt bandage for the penis is a pouch, or bag of linen or cotton, to be fixed by

a roller, or two pieces of tape paſſed round the body.

The T-bandage, as it is commonly termed, Plate XCVI. figures. 3. and 4. is uſually employed for the retention of dreſſings in affections of the anus and perineum, as well as in ſome diſorders of the ſcrotum; but in the laſt, one or other of the ſuſpenſory bandages, repreſented in Plate. XCVII. will for the moſt part be found preferable.

10. In compound fractures of the arm, fore-arm, or hand, where motion of the limb would prove hurtful, the twelve or eighteen tailed bandage is equally proper as in ſimilar affections of the lower extremities; but in ſimple fractures as well as in almoſt every other affection of theſe parts, we prefer a proper application of the roller.

11. We adviſed the uniting bandage for longitudinal cuts in the head; it anſwers equally well in wounds of a ſimilar nature in every part of the extremities, as is repreſented in Plate XCV. fig. 6.

EXPLA-

PLATE. XCVII.

FIG. 1.

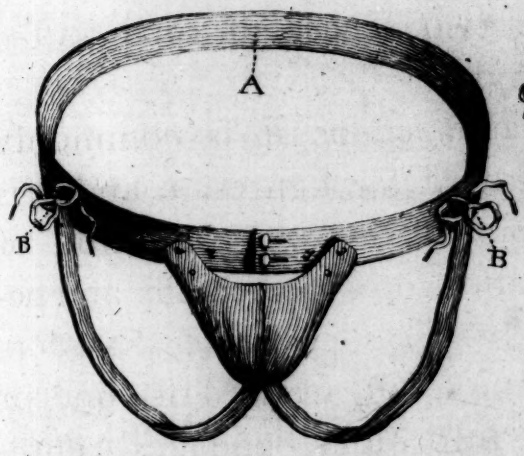


FIG. 2.

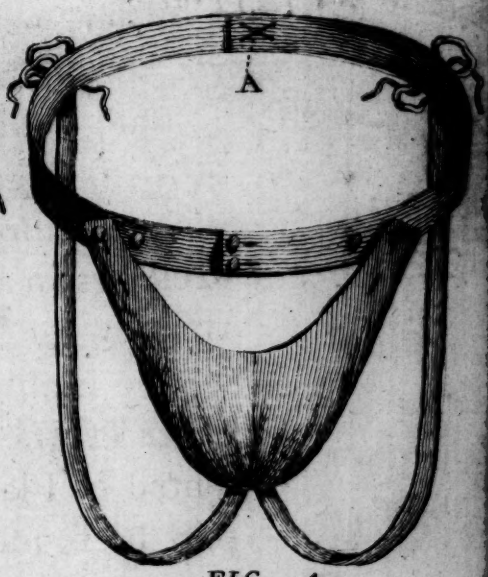


FIG. 3.

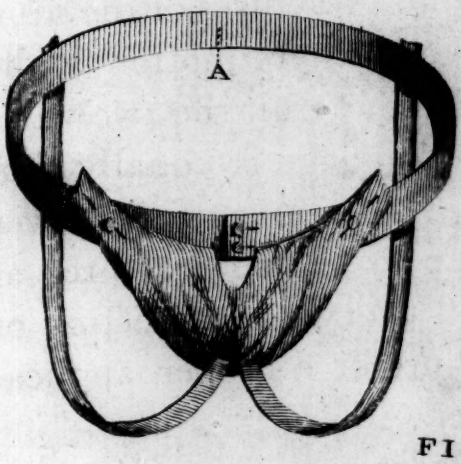


FIG. 4

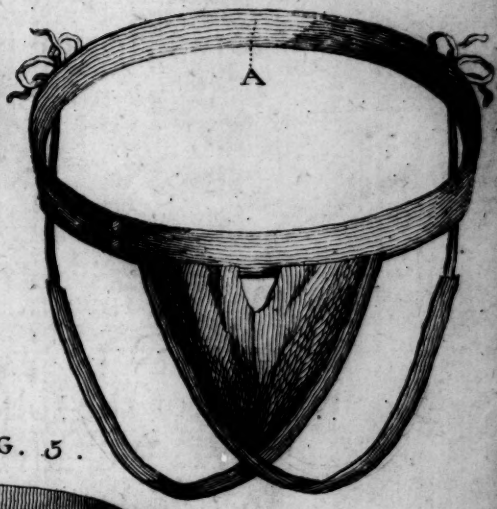
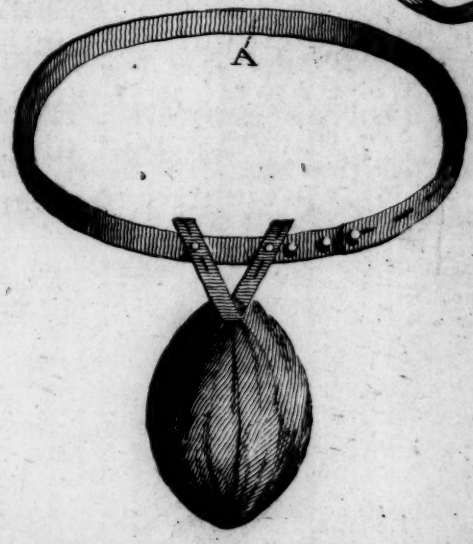


FIG. 5.



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EXPLANATION OF THE PLATES.

PLATE LXX.

[Oppoſite to page 86.]

Fig. 1. A ſplint of timber for a fractured leg, A A. Two loops for retaining leather ſtraps, as repreſented in the front view of the ſame ſplint in fig. 2. *CC. B*, an opening for receiving the external maleolus when the leg is placed upon the outſide.

Figures 3. 4. 5. and 6. are perhaps the beſt ſplints hitherto diſcovered for fractures of any of the extremities. They may be made of different forms, but one or other of theſe will anſwer almoſt for any purpoſe: They are made by glue-

ing

ing a piece of thin timber, about the tenth part of an inch in thickneſs, upon leather. The timber is afterwards cut through to the leather, either with a fine ſaw or a knife ſet to a proper depth, in the manner repreſented in the figures.

Theſe ſplints are preferable to thoſe made of paſteboard; for while they are longitudinally perfectly firm, they are tranſverſely ſufficiently flexible for plying to the form of the limb. For the method of uſing them, we muſt refer to Sections IX. X. XI. and XII. of Chapter XXXIX.

Splints made in this manner have long been uſed by individuals; but Mr Gooch was the firſt who gave any deſcription of them.

Plate LXXI.

[Oppoſite to page 96].

As the ſplints uſed by Mr William Sharpe are ſtill preferred by ſome practitioners, I have given a repreſentation of them in this Plate.

Theſe ſplints, figures 3. and 4. are formed

formed of ſtrong paſteboard made with glue; they are fixed upon a fractured leg by three ſtraps which ſurround the whole.

Fig. 4. Repreſents an under ſplint of an irregular form, ſuitable to that part of the leg it is meant to cover: It is a little convex externally, and concave internally The length for a middle-ſized man, eighteen inches from *E* to *E*; the width, two inches and three quarters at the ſtrap near the knee, and two inches and a quarter at both the other ſtraps.

DFDFDF, three leather ſtraps from fifteen to twenty inches long, and one inch wide, having two rows of holes ſo placed, that every hole in each row may be oppoſite to a ſpace in the other. Theſe muſt be ſowed faſt to the middle and outſide of the under ſplint. The portions of ſtraps *DDD*, on the anterior part of the ſplint, muſt be ſhorter than thoſe on the poſterior, *FFF*, which are to ſurround the more muſcular part of the leg.

G, A part to ſupport the foot from the point *E* to the heel *H*, five inches long at an angle of ſixty degrees.

C, The foot ſtrap, twelve inches long, ſowed to the bottom of the under ſplint, within two inches of the point, to paſs under the heel and through the leather loop *B* on the upper ſplint to the loweſt pin *A*.

I, An irregular oval hole, two inches long, and almoſt one wide in the loweſt part, but decreaſing upwards to receive the maleolus externus or lower extremity of the fibula.

Fig. 2. Repreſents the leg raiſed up, to ſhow the ſituation of the under ſplint when properly applied.

Fig. 3. The upper ſplint. *AAA*, The pins upon which the ſtraps of the under ſplint are to be fixed by means of the holes *DDD*, *FFF*. *B*, the leather loop for receiving the foot-ſtrap *C*, in fig. 4.

Fig. 1. Repreſents a fractured leg

when laid within the ſplints, having the foot of a ſtocking and a ſhoe upon it.

PLATE LXXII.

[Oppoſite to page 100.]

In this Plate I have delineated the inſtruments recommended by the late Mr Gooch, for preſerving a fractured thigh and leg in a ſtate of extenſion, as is mentioned more particularly in page, and which I ſhall deſcribe in his own words.

Fig. 1. A machine for extending a fractured leg. The tranſom to which the ſole is ſecured, is made to be opened and fixed by a pin; and the machine may occaſionally be made wider, as appears by other holes in the tranſom; about which, on each ſide of the ſole, fillets are to be tied, coming from a demity piece quilted for eaſe, and laced round the heel and inſtep, to make the extenſion upon the working of the ſcrews; but buff leather may poſſibly anſwer better for protecting the parts even than demity.

Fig.

Fig. 2. Shows the machine, and one of the ſplints in Plate LXX, together upon the limb.

Fig. 3. The longitudinal parts of the machine for the thigh are deſigned to move upon the circular plates; by which means it may be accommodated to limbs of different ſizes: and as there is a pin at each end of the circular plates, if the limb happens to be larger than ordinary ſtraps of leather may be added.

Fig. 4. Shows the machine with the caſe upon the thigh.

Fig. 5. The key to work the ſcrews. There ſhould be two ſuch keys, that the machine may occaſionally be wrought on both ſides at the ſame time.

Plate LXXIII.

[Oppoſite to page 109].

In page 109. we obſerved, that ſome improvements had been made by Dr Aitken upon Mr Gooche's inſtruments, repreſented in the preceding plate, for extending fractured limbs: In this plate I have given a repreſentation of them.

Fig. 1. Repreſents a machine for keeping the fragments of the thigh-bone *in ſitu* after ſetting, whether the fracture is ſimple or compound, on the neck or body of this bone. *AAA*, the upper circular which applies round the *pelvis*, like the top-band of a pair of breeches. It reſts on the ſame parts, and is fixed or buttoned in the ſame manner, by the ſtuds and correſponding holes, *H*.

BB, Two ſoft-ſtuffed ſtraps fixed to the back-part of this circular, of ſuch length as to paſs between the thighs from behind foreward, to tie round the fore-part of the ſame circular by means of their forked extremities *CC*. Theſe effectually ſecure the circular from moving upward. There are two obſcure joints *KK*, in the back-part of this circular, to facilitate its application; but it applies readily enough without them.

DD, The lower circular which fixes above the knee at the gartering place.

EEE, Three graduating ſteel ſplints which

which extend from the one circular to other: Their upper extremities are fixed to the upper circular by vertible flat-headed ſtuds, ſimilar to thoſe at *FF*: their lower extremities paſs through the iron ſcrew plates *G*, firmly rivetted to the lower circular. The ſplints are provided with a number of impreſſions or holes, in which the ſcrew-nails which paſs through the plates are fixed. By puſhing the ſplints from below upward, the diſtance between the circulars is increaſed; and by turning the ſcrew-nails it is maintained: conſequently that part of the thigh included between the circulars can be kept extended at pleaſure. The ſplints here are fixed for the right thigh; the pricked lines on the other ſide, ſhow how they may be accommodated for the left one, or for both at the ſame time.

The largeſt circular *AAA*, conſiſts of a piece of thick ſaddle-leather; all except its perforated part, and about a quarter of an inch on each edge, is covered

on

on the inſide with a flexible thin iron plate, ſuch as is ſometimes uſed by tin-plate workers: Over this it is lined with the ſofteſt buff, or ſhamoy leather, between which and the plate a thin layer of hair or wool is interpoſed: the lining ought to project on both ſides half an inch or more, to prevent it in any degree from preſſing on the ſkin.

The ſmall circular *DD*, or inferior fixed point, is exactly ſimilar to the large one in ſtructure, the tin-plate excepted; which, on account of its ſmaller diameter, was found to be unneceſſary.

The breadth of the upper circular, when extended for an adult, may be from three to four inches: That of the under circular ſhould be in the ſame proportion.

The graduating ſteel ſplints, *EEE*, muſt be ſufficiently long to extend from the upper circular to the lower, and to project over it about a hand-breadth: They require to be about four or five

eighth-parts of an inch broad, and about one eighth part of an inch thick.

Fig. 2. A machine conſtructed on the ſame principle with fig. 1. for the retention of a fractured leg.

AA, A circular, which applies below the knee-joint.

BB, Another, which fixes at the ankles.

CCC, The graduating ſplints ſimilar to thoſe of the thigh-machine, both in conſtruction and action.

Fig. 3. A fracture-box mentioned in page 150. as the invention of Mr James Rae Surgeon of this place, improved by Mr John Rae his ſon.

A, The ſole or baſe, which ſhould be a firm deal at leaſt an inch and half thick. *BB*, the two ends which ſupport the ſide beams *CCCC*. *DD*, Braſs hinges, which admit of the ends folding down ſo as to render the machine more portable than it otherwiſe would be. *LL*, two parallel grooves for receiving two projecting parts of the correſponding end

of

of the machine, by which the ſame inſtrument may be extended or ſhortened ſo as to fit any length of member. *EEEE*, Two lateral beams, which by the holes in their extremities will ſerve for any length to which the inſtrument may be extended: And by the pin at each end paſſing through them at the holes in the end beams, any one of the ſides, or both of them, may be raiſed at pleaſure.

GGGG, &c. Twelve or fourteen buckles on each ſide of the machine, with correſponding pieces of girth two inches broad, on which the member is ſupported by buckling them exactly to the form of the limb. *HI, HI*, Two ſtraps, with correſponding buckles for fixing the baſe of the machine to the bed. The limb is fixed to the machine by two ſtraps and buckles, one fixed at each end.

The advantages of this inſtrument are, that in compound fractures the ſores can be inſpected and dreſſed without deranging or moving any part of the limb,

by removing ſuch of the ſtraps as are neceſſary for bringing the ſores into view. Inſtead of a twelve or eighteen tailed bandage of the common form, ſeparate pieces of flannel ſhould be uſed; ſo that ſuch of thoſe as are wet with the diſcharge can be eaſily moved without touching the reſt.

In this manner the limb may be regularly dreſſed without being moved till the cure is completed, while the limb may be raiſed to any angle, by heightening one or other of the ends of the lateral beams by means of the holes and pins at each end.

PLATE LXXIV.

[Oppoſite to page 122.]

Fig. 1. A fractured limb dreſſed with an eighteen-tailed bandage, and laid upon the outſide with the knee bent, in the manner recommended by Mr Pott.

Fig. 2. A fractured limb with an eighteen-tailed bandage, and one of the flexible ſplints in Plate LXX. There

is alſo placed beneath the limb a firm unyielding ſplint, ſuch as is repreſented in the ſame Plate, fig. 2.

PLATE LXXV.

[Oppoſite to page 129.]

Fig. 1. A machine mentioned in page 117. for retaining the different parts of a fractured patella.

A, A ſtrap to be fixed by means of the buckle at one end on the upper part of the leg immediately below the keee. *B*, A ſimilar ſtrap to be fixed above the knee.

Fig. 2. A back view of the ſame machine. *F*, A ſemilunar compreſs of cork covered with ſhamoy leather, to be placed immediately above the upper part of the patella. *A*, A ſimilar compreſs for ſupporting the inferior part of the bone.

Theſe compreſſes being properly placed, they may be drawn to any degree of tightneſs by means of the ſtraps and buckles *CDE*.

Fig. 3. A limb with a fractured patel-

la, and the bandage fig. 1. applied to it. In this figure the ſtrap, *H*, is added to it: being fixed to the point of the ſhoe, and connected with one of the buckles above the knee, the limb is thereby kept extended; by which there is no riſk of the fractured parts of the patella being forcibly pulled from each other, as would neceſſarily happen if the limb ſhould be ſuddenly bent before the cure be completed.

PLATE LXXVI.

[Oppoſite to page 140].

Fig. 1. This repreſents the Ambe of Hippocrates, for the reduction of luxations of the humerus: it conſiſts of a fulcrum and moveable lever. As it is ſtill uſed by ſome practitioners, I judged it proper to mention it; but we have elſewhere had occaſion to remark, that it is a dangerous inſtrument, and ought never to be employed. My reaſons for thinking ſo are enumerated in Chapter XL. Section IX.

Fig.

Fig. 2. Mr Petit's inſtrument for reducing luxations of the humerus. *A A*, Two arms or horns, by which the ſcapula is kept firm during the extenſion. *B B*, The other end of the inſtrument reſting upon the ground; *C*, the pullies; *D*, ropes by winding up which with the handle *E* the limb may be ſlowly and gradually extended to any neceſſary degree.

Fig. 3. *A C*, an opening through which the arm is paſſed; *F F*, two apertures for receiving the ends *A A* of the inſtrument fig. 2. This being made of firm leather, the inſtrument is thereby prevented from fretting or galling the ſkin.

PLATE LXVII.

[Opppoſite to page 148].

Fig. 1. The Ambe of Hippocrates, repreſented by itſelf in the preceding Plate, is here applied and ready to be uſed.

Fig. 2. Pullies for extending diſlocated bones, as mentioned in page 231.

Fig. 3. This is a very uſeful part of the apparatus for extending diſlocated limbs: It is formed of thick ſhamoy or buff leather. By tying it firmly round the limb with the broad ſtraps at each end, a very conſiderable force may be applied by aſſiſtants pulling the ropes or ſtraps paſſed over the hooks; it anſwers the purpoſe both more eaſily and more effectually than the common method of extending the limb with towels.

Plate LXXVIII.

[Oppoſite to page 236.]

In this Plate I have delineated one of the beſt inſtruments hitherto known for diſlocations of the ſhoulders, when more than ordinary force is required. It is the invention of the late Mr Freke of London.

As inſtruments of this kind reqüire to be very portable, Mr Freke has paid particular attention to this circumſtance. The box, fig. 5. contains the whole apparatus;

paratus; when ſhut, it is only one foot eight inches long, nine inches broad, and three inches and a quarter deep. Fig. 4. repreſents the inſtrument open, the two ſides of the box being firmly fixed together by braſs hinges at *C*, and with too hooks and eyes on the other ſide of the box. When one end of it is fixed on the ground, the other ſtands high enough to become a fulcrum or ſupport for the lever *BB*, which is fixed on the roller *E* by a large wood ſcrew, which turning ſideways, as well as with the roller, it obtains a circumrotatory motion, ſo that it may ſerve to reduce a luxation either backward, forward, or downward.

The roller on which the lever is fixed is juſt the diameter of the depth of one of the boxes, into which are driven two iron pins, the ends of which are received by the two ſides of the box, which are an inch thick.

The lever is two feet four inches long, and is cut and joined again by two hinges at

at *C*, to fold up ſo as to be contained in the box: on the backſide of it is a hook to keep it ſtrait; the other end of it is to hang over the roller an inch and a half, which is to be excavated and covered with buff-leather for the more eaſy reception of the head of the os humeri.

The iron roller *E* has two holes thro' it for receiving two cords from a brace fig. 3. fixed on the lower head of the os humeri, for on no other part of the arm above the cubit can a bandage for this purpoſe be uſeful; for if the ſurgeon applies it on the muſcular part of the arm, it never fails ſlipping down to the joint before the limb can be extended.

The iron roller *E* has a ſquare end, on which is fixed a wheel *D*, notched round, which works as a rotchet on a ſpring ketch under the lever; by which it is ſtopped as it is wound up with a winch, ſo that at pleaſure it may be let looſe by diſcharging the ketch.

The brace, fig. 3. conſiſts of a large piece

piece of buff-leather large enough to embrace the arm, ſowed on two pieces of ſtrong iron curved plates rivetted together, one of them having an eye at each end to faſten two cords in; the other is bent at the ends into two hooks, which are to receive the cords after they have croſſed the arm above.

In order to keep the patient ſteady in his chair, and to prevent the ſcapula from riſing on depreſſing the lever, after the limb is drawn forward by the winch, there muſt be fixed over the ſhoulder a girth with two hooks at the end of it, as is repreſented in fig. 2. The girth ſhould be long enough to reach the ground on the other ſide, where it muſt be hooked into the ring *B*, ſcrewed into the floor for that purpoſe, as in fig. 1.

Plate LXXIX.

[Oppoſite to page 248].

In this Plate I have delineated an inſtrument mentioned in Chapter XLI, for the

the purpoſe of removing contractions of the ham-ſtrings or flexor tendons of the leg.

Fig. 1. A front view of the inſtrument: *AA*, two curved ſteel plates connected together by a firm ſteel ſplint *D*, in fig. 2. One of theſe is to be applied to the back part of the thigh, and the other to the upper and back part of the leg; while by means of the leather ſtraps *EE*, ſuch a degree of preſſure is made as the patient is able to bear.

BB, fig. 1. Is a ſoft cuſhion of quilted cotton for ſurrounding the limb to prevent the leather ſtraps from fretting it. The curved plates *AA* ſhould for the ſame purpoſe be lined with ſhamoy.

Fig. 2. A back view of the ſame inſtrument.

Fig. 3. A limb with the inſtrument applied on it.

Plate LXXX.

[Oppoſite to page 260.]

I have here delineated a fracture box, mentioned

mentioned in page 126. It is formed upon the ſame principle, but ſomewhat more ſimple in the conſtruction than Mr Rae's in Plate LXXIII. fig. 3.

Fig. 1. *AA*, The baſe or bottom of the inſtrument, formed of deal an inch and half thick. *BB*, Two ends riſing from the baſe, and terminating in the pillars *CCCC*. *DD*, An excavated moveable piece of timber for ſupporting the fractured limb. This moveable part of the inſtrument may be raiſed and ſupported at any height by the pins *EE* paſſing through the holes in the pillars *CCCC*; and it may at pleaſure be raiſed at one end and depreſſed at the other.

HH, Two ſtraps connected with buckles on the oppoſite ſide for fixing the limb after it is properly placed. Before laying down the leg, the dreſſings ſhould be all applied, and the excavated part of the inſtrument ſhould be completely lined with ſoft wool. *G*, A hole for receiving the heel to prevent it from being

being hurt when the leg is ſtretched out, as repreſented in fig.

The ends, *B B*, may either be fixed to the baſe of the inſtrument, or, in order to render it more portable, they may be made moveable, and fixed for uſe by a double pin at each end *F*.

PLATE LXXXI.

[Oppoſite to page 277.]

In Chapter XXXIX. Section V. as well as in other parts of this work, we had occaſion to recommend an inſtrument for ſupporting the fore-arm as being preferable to any bandage. A repreſentation is given of it in fig. 1.

A A, a caſe or frame of firm leather properly lined with flannel and wool, of a ſufficient length for covering the arm from the elbow to the point of the fingers. This is intended for the left arm. *B*, A collar of ſoft buff leather for paſſing over the right arm, in order to ſupport the fore-part of the caſe by the ſtrap *F* paſſing over the left ſhoulder, to be fixed to

a

a buckle at *C*, to prevent the coller *B* from ſlipping down. *G H*, Two ſtraps and buckles for fixing the arm down to the inſtrument.

The application of this inſtrument will be better underſtood by the view of it in fig. 2.

I was favoured with this inſtrument by Dr Monro, to whom, I believe, it was ſent by Mr Park of Liverpool.

Figures 3. and 4. Two artificial legs, delineated by Mr White of Mancheſter in his Caſes in Surgery. Fig. 4. *A A*, A hollow leg made of tin, and covered with thin leather. *B*, A leather ſtrap with a buckle on the outſide, for fixing it below the knee. *C D*, Longitudinal ſteel bars, to be made as tough and light as poſſible, with ſufficient ſtrength. Theſe bars are joined by a moveable joint, to be placed exactly oppoſite to the knee-joint. *E*, A ſteel bow made thin and elaſtic, to paſs about two thirds round the lower part of the thigh, and fixed with ſtraps of leather to buckle on the fore-part.

Fig. 3. Another artificial leg made in the

the ſame manner with fig. 4. with the addition of a foot made of light wood and moveable joints, ſo as to imitate pretty nearly the natural motions of the joints of the ankle and toes.

PLATE. LXXXII.

[Oppoſite to page 293.]

Fig. 1. A machine invented by an ingenious tradeſman of this place, Mr Gavin Wilſon, for diſtortions of the leg. This ſubject was treated of in Chapter XLI. *AA*, A caſe of firm leather open before, for receiving the diſtorted leg and foot. *BC*, A ſplint of iron for giving an additional firmneſs. The leg being placed in this caſe, the foot is fixed down to the bottom or ſole of it by the ſtrap *H* paſſed through the hole *I*; and the leg itſelf is gradually drawn either to one ſide or another according to the nature of the diſtortion, and ſecured by a proper application of the ſtraps *DF*, to be fixed upon the braſs hooks *GE*. By a due perſeverance in the uſe of this ma-

chine, many bad caſes of diſtorted limbs have been completely cured.

Fig. 3. A pair of ſhoes which have proved ſerviceable in ſome caſes of diſtortions of the ankle-joint, where the toes have been turned too much inward. As they are light they may be uſed even in early infancy. After the feet are fixed in the ſhoes by the laces before, the toes may be ſeparated to a proper diſtance, and preſerved in this ſituation by the apparatus at *A*; which conſiſts of three ſmall iron plates, more particularly delineated in fig. 5. and at *B*, fig. 4. Fig. 5. conſiſts of two parallel thin plates, fixed with nails to the outſide of the ſole of one ſhoe; and they are ſo far ſeparated from each other, as to receive the round plate *B* between them, the end of which is fixed to the ſole of the other ſhoe. The three plates are connected together by a nail paſſing through the hole in the centre of each. This admits of a conſiderable degree of motion, by which the toes may be moved either outward or inward; but they can be eaſily fixed at any particular

point by a ſmall iron pin *A* paſſed thro' one or other of the holes in the ſide of the plates *B*.

PLATE. LXXXIII.

[Oppoſite to page 296.]

In this Plate I have delineated an apparatus mentioned in Chapter XLI. for diſtortions of the legs.

Fig. 1. *AB*, An iron ſplint properly covered with ſoft leather fixed in an iron frame *C*. The ſplint may be made to fix on either ſide of the frame according to the nature of the curvature. In a diſtorted leg the foot is to be fixed down to the frame *C* by means of the ſhoe repreſented in figure 3. This is eaſieſt done by paſſing a nail through the heel of the ſhoe into the frame upon which the ſhoe may move. If the leg is bent outward, the ſplint *AB*, fig. 1. is placed on the inſide, and it ſhould be of ſuch a length that the pad *B* may reſt upon the internal condyle of the knee joint, where it ſhould be fixed by the ſtrap *E*. When the bones are

bent inward, the ſplint muſt be placed on the outſide of the leg.

The ſtraps *EF* muſt be paſſed two or three times round the convex part of the leg, and ſhould be made to preſs it with ſome degree of force toward the ſplint; and by increaſing the preſſure from time to time, the convexity or curvature will be gradually leſſened till at laſt it may in many inſtances be totally removed. By means of the ſtrap *C*, the toes are to be drawn from that ſide to which they incline, and fixed to the oppoſite ſide of the frame. The ſcrew-nail *D* determines what is gained from time to time, by moving it from one hole in the frame to another.

Fig. 4. A machine invented by the late Mr Gooch, for giving ſupport to weak limbs as well as for removing diſtortions. *AAA*, Three ſteel-bows made thin and very elaſtic: They muſt ſtand clear of the tibia; muſt paſs about half round the limb, and be fixed with ſtraps of leather upon round-headed pins.

BBB, A longitudinal plate, to be made of tough ſtuff, as the workmen term it, and as light as poſſible with ſufficient ſtrength.

C, The ſhank to paſs into the ſocket, in that part of the machine which is to be fixed into the heel of the ſhoe or laced boot, and confined there by a ſcrew at the bottom.

D, The ſcrew to keep the ſhank in the ſocket.

Plate LXXXIV

[Oppoſite to page 339].

Fig. 1. A ſmall ſpring ſaw uſed in amputating the fingers and toes.

Fig. 2. and 3. Retractors made of thin iron plates for drawing up and ſupporting the muſcles and other ſoft parts in amputating limbs while the ſaw is applied to the bones. They ſhould be kept with openings of different ſizes, ſo as to anſwer where the bone is large or ſmall, or whether there be two bones or only one.

Fig. 4.

Fig. 4. A piece of firm ſlit leather, which anſwers the purpoſe of a retractor extremely well. It is better ſuited for this than a bit of linen, which is generally uſed, but which does not ſupport the parts with ſufficient firmneſs.

PLATE LXXXV.

[Oppoſite to page 341].

Fig. 1. The ſaw I always uſe in the amputation of legs and arms: It ſhould be ſeventeen inches in length, including the handle, and two inches and a quarter in breadth at its broadeſt part.

Fig. 2. A ſmall double-edged knife, commonly termed a Catline, for the purpoſe of dividing the interoſſeous ligaments and other ſoft parts in amputating the leg and fore-arm: It ſhould be nine inches long.

Fig. 3. An amputating knife, which anſwers either for the thigh, leg, or arm: It ſhould be thirteen inches in length.

Fig. 4. A ſmall crooked knife for ſeparating the muſcles from the bone, in

the manner I have adviſed in the Chapter on Amputation, Section IV.

PLATE LXXXVI.

[Oppoſite to page 439].

In Chapter XLV. I gave ſome account of an ingenious propoſal by Mr Moore of London for diminiſhing and preventing pain in ſeveral operations of ſurgery. It is done by compreſſing the nerves of the limb upon which an operation is to be performed. In this Plate I have repreſented the apparatus recommended by Mr Moore for this purpoſe.

Fig. 1. *A*, The compreſſing inſtrument, being formed of a curved piece of iron covered with leather, and of ſufficient capacity to contain the thigh within its curve.

B, A firm compreſs of leather at one extremity of the inſtrument, to be placed on the ſciatic nerve.

D, An oval compreſs fixed on a ſcrew, paſſing through a hole at the other extremity

tremity of the inſtrument. This compreſs to be placed on the crural nerve.

When this inſtrument is to be uſed, it will be neceſſary in the firſt place to ſearch for the ſciatic nerve: For this purpoſe let the operator feel for the tuberoſity of the iſchium, and then for the great trochanter; and ſuppoſing a ſtraight line drawn from the one to the other, apply the compreſs *B* about an inch above the middle of that line.

The crural nerve is found by the pulſation of the crural artery, which runs contiguous to it; the oval compreſs *D* muſt next be applied above it; and upon turning the ſcrew connected with it, the ſciatic nerve is preſſed by *B* againſt the edge of the ſciatic notch, and the crural nerve againſt the os femoris to any degree that is neceſſary.

Fig. 2. Repreſents the inſtrument adjuſted to the thigh; and fig. 3. a ſmaller compreſſor ſuited to the arm.

PLATE LXXXVII.

[Oppoſite to page 441].

In this Plate I have given a repreſentation of an artificial leg and arm made by a very ingenious artiſt of this place, who I have in different parts of this Work had occaſion to ſpeak of, Mr Gavin Wilſon.

Fig. 1. An artificial leg made of firm hardened leather.

A, An oval piece of the ſame kind of leather lined with ſhamoy, fixed upon a plate of iron *C*, and moving upon an axis at the knee. The ſtrap *I*, with the buckle connected with it, ſerves to fix it to the thigh. There muſt alſo be an oval piece connected with a ſimilar iron plate on the oppoſite ſide of the thigh: Theſe iron plates and oval pads ſhould together go about nine inches up the thigh.

B, A ſtrap that comes from the ſole of the foot, and goes up on the inſide of the leg to the middle of the thigh, where it

is

is fixed by a buckle to a ſtrap coming from the oppoſite ſhoulder: This ſerves to ſupport the leg, and to take the weight of it more effectually from the weak ſide than any invention I have met with.

Fig. 3. The oval piece of leather and iron ſplint to which it is fixed.

Fig. 4. A piece of ſoft ſhamoy leather which fixes by a buckle and ſtrap round the condyles at the knee. In legs of this kind, the perſons weight reſts upon the condyles and patella, the ſtump itſelf hanging quite free within the leg. This band or ſtrap ſerves in the moſt effectual manner to prevent pain and excoriation, which otherwiſe would probably enſue from the friction of the leg againſt the knee.

Fig. 2. A fore-arm and hand made of the ſame kind of leather, and made to fix to the arm and ſhoulder by the ſtraps *DE*.

Theſe artificial legs and arms are preferable to any I have ever ſeen. The leg, when properly fitted, proves equally uſeful

uſeful with the common timber leg, and it is preferable, from being neater; at the ſame time, that it is not liable to break, an accident to which the others are very liable: and it anſwers better than a leg made of copper, from being conſiderably lighter, and not apt to be hurt in its ſhape by bruiſes.

Mr Wilſon makes three different kinds of legs correſponding to the part at which the limb is amputated. In amputating the leg lower than the uſual part, that is, in ſuch a manner that the motion of the knee is to be retained, it anſwers better at the diſtance of nine or ten inches from the condyles of the knee than either higher or lower. When higher, the remaining part of the leg is not ſufficient to ſupport the artificial leg in walking; and when much lower, it renders it neceſſary to make the machine thicker about the ankle than would otherwiſe be required, by which it is rendered clumſy and heavier. Fig. 1. in this Plate repreſents a leg for this part.

The ſecond kind of artificial leg made by

by Mr Wilſon is intended for thoſe caſes where the amputation has been performed at the uſual place below the knee, where the weight of the body reſts upon the knee-joint and upper part of the leg upon a ſoft ſtuffed cuſhion.

Theſe legs have no flexion at the knee, and the hollow for receiving the thigh goes up near to the hip: It opens behind to admit the thigh; it is fixed with three ſtraps and hooks, which laſt are not only ſtronger, but leſs bulky than buckles.

When a limb is amputated above the knee, a joint is formed in the artificial leg at the knee. In walking, the limb is made ſteady by a ſteel bolt running in two ſtaples on the outſide of the thigh being puſhed down; and when the patient ſits down, he renders the joint flexible by pulling the bolt up. This is eaſily done, and it adds much to the utility of the invention.

The reſt or ſupport in this leg is obtained in part from its embracing the upper part

part of the thigh tightly, but chiefly from the back part of the thigh box-being ſtuffed in ſuch a manner that the lower part of the hip reſts upon it with nearly the ſame eaſe that one does in ſitting on a ſtuffed chair; and in fact, a perſon ſits on it when he either ſtands or walks; by which, and by the ſtrap carried up from the ſole of the foot to the ſhoulder, the limb is very eaſily carried about.

Mr Wilſon's artificial arms, beſides being made of firm hardened leather, are covered with white lambſkin, ſo tinged as very nearly to reſemble the human ſkin. The nails are made of white horn, tinged in ſuch a manner as to be a very near imitation of nature.

The wriſt-joint is a ball and ſocket, and anſwers all the purpoſes of flexion, extenſion, and rotation. The firſt joints of the thumb and fingers are alſo balls and ſockets made of hammered plate-braſs, and all the balls are hollow to diminiſh their weight. The ſecond and third joints are ſomewhat ſimilar to that which anatomiſts

miſts term Ginglimus, but they are ſo far different as to admit of any motion, whether flexion, extenſion, or lateral.

The fingers and metacarpus are made up to the ſhape, with ſoft ſhamoy leather and baked hair. In the palm of the hand there is an iron ſcrew, in which a ſcrew-nail is occaſionally faſtened. The head of this nail is a ſpring-plate, contrived in ſuch a manner as to hold a knife or a fork, which it does with perfect firmneſs. And by means of a braſs ring fixed on the firſt and ſecond fingers, a pen can be uſed with ſufficient exactneſs for writing.

When only a hand and fore-arm is needed, it is fixed to the arm above the elbow by a ſtrap of leather ſowed to one of the ſides of the artificial fore-arm. After making a turn and a half juſt above the elbow, the ſtrap is fixed on the back part of the limb at *D*, fig. 2.

When the arm is amputated above the elbow, the artificial limb is made with an elbow-joint. This part of it is made of wood,

wood, and has a rotatory motion as well as that of flexion and extenſion.

I have given this particular account of Mr Wilſon's invention, from a conviction of its being ſuperior to any with which the public is acquainted: I am alſo pleaſed at having it in my power to let the merit of ſuch an artiſt be more generally known than it otherwiſe might be. Indeed his merit in matters of this kind is ſo conſpicuous, as well as in the management of diſtorted limbs, that his death I would conſider as a public loſs, at the ſame time that I have often wiſhed that ſome public encouragement were given him, to enable him to communicate as much as poſſible the reſult of his experience to others.

PLATE LXXXVIII.

[Oppoſite to page 445.]

In this plate I have delineated two machines for ſupporting the head and ſhoulders, commonly employed in diſtortions of the ſpine.

Fig.

Fig. 1. *A*, An iron collar properly covered for paſſing round the neck. By means of the long iron plate connected with it, it may be raiſed or depreſſed at pleaſure. *BBB*, A broad iron plate fitted to the back and ſhoulders. *CC*, Two ſtraps to be carried over the ſhoulders; and being brought through beneath the armpits, to be fixed, of a ſufficient tightneſs, on two knobs on the ſhoulder-plates, as may be ſeen in fig. 2. *D*, A ſtrap for fixing the plate going down the back, by being tied round the body.

Fig. 3. An iron or ſteel inſtrument, delineated by Heiſter for the ſame purpoſe with the preceding. *AA*, Its tranſverſe part, to which are faſtened iron rings *CC* for retaining and keeping back the ſhoulders. *B*, The perpendicular part going down the back. *D*, A band or ligature paſſing through an aperture in the lower end of the plate *B* for tying it firmly to the body.

PLATE

PLATE LXXXIX.

[Oppoſite to page 449.]

In this and the four following plates I have delineated the inſtruments employed in midwifery.

The forceps is perhaps the beſt, as it is the ſafeſt, inſtrument employed by the Accoucheur.

Various forms of it have been recommended by practitioners; but the one delineated in this Plate has been found to anſwer perhaps better than any other. It appears to be ſufficiently long, and the blades apply with perfect exactneſs to the child's head.

This inſtrument ſhould meaſure eleven or twelve inches in length. Some have alleged that they ſhould be longer, in order to prevent their locking within the vagina, and that they may with more eaſe be applied when the head of the child lies high in the pelvis; but the

length we have mentioned is by experience found to be ſufficient.

PLATE XC.

[Oppoſite to page 452.]

Fig. 1. A ſingle blade of the common crotchet: An inſtrument employed for tearing away the fœtus piece-meal when it cannot be delivered entire. From the form of this inſtrument, it is obvious that it cannot be uſed but with much riſk even of hurting the mother. The beſt rule for preventing this is to keep the point of it always towards the fœtus.

Fig. 2. The two blades of the crotchet locked together; in which way they may be uſed with perfect ſafety to the mother.

Fig. 3. Sciſſars uſed for perforating the ſkull of the fœtus, where the pelvis is ſo narrow that delivery cannot be otherwiſe accompliſhed. After emptying the cranium of its contents, the child is extracted piece-meal either with the crotchet or with the blunt-hook, fig. 2.

Plate XCI. or with the forceps, figure 1. or 3. of the ſame Plate.

The ſciſſars here repreſented are thoſe recommended by Doctor Denman.

Plate XCI.

[Oppoſite to page 456.]

The forceps, figures 1. and 3. as well as the blunt-hook, figure 2. of this Plate, are intended, as was mentioned in the explanation of the preceding Plate, for extracting the fœtus piece-meal, when it has been judged proper to accompliſh delivery in this manner.

Plate XCII.

[Oppoſite to page 459.]

The inſtruments in this Plate, and the fillet fig. 3. in Plate XCIII. are the invention of my friend Sir Thomas Bell, a practitioner of eminence in Dublin. They are chiefly intended for extracting the head of the fœtus, when by accident or improper management it is ſeparated from

from the body in caſes of narrow pelvis.

By a proper application of the fillet juſt mentioned, he fixes the head ſteadily till it be ſufficiently opened for diſcharging the brain; when by means of the forceps here delineated, he performs the extraction. Theſe forceps conſiſt of two blades; one nearly of the ordinary form; the other convex: and its convexity being adapted to the concavity of the other, the two occupy much leſs ſpace than they otherwiſe would do; by which they are peculiarly well fitted for the narrow pelvis we are now ſpeaking of. The teeth with which one of the blades is furniſhed, give theſe forceps a very firm hold of any part to which they are applied: And as it is an inſtrument that may be uſed with ſafety, I think it probable that it may in many caſes ſuperſede the uſe of the crotchet.

PLATE XCIII.

[Oppoſite to page 462.]

Fig. 1. A fillet of whale-bone covered with a ſheath, which by ſome operators is employed, in caſes of difficult labour, for pulling down the head of the fœtus. In general, however, the forceps is preferred to it.

Fig. 2. A curved inſtrument, with an opening at one end, for applying ligatures round polypous excreſcences in the uterus. It is the invention of the late Doctor Hunter of London, and it anſwers the purpoſe in the eaſieſt and moſt effectual manner.

Fig. 3. A fillet mentioned in the explanation of the preceding plate as the invention of Sir Thomas Bell of Dublin: It is a material improvement of the common fillet repreſented in figure 1. of this Plate.

PLATE XCIV.

[Oppoſite to page 473.]

Fig. 1. I have here delineated a night-cap, fixed in ſuch a manner as to ſerve as one of the beſt bandages for the head.

Fig. 2. The common triangular napkin, or couvre-chef of the French, uſually employed as a bandage for the head.

Fig. 3. The radiated bandage, as it is uſually termed. It is commonly employed for compreſſing the temporal artery; and it will anſwer equally well for ſtopping hemorrhagies in any arteries of the head, as may be ſeen in fig. 4. where the knot or turn is made at the angle of the jaw.

Fig. 5. The bandage uſually employed for fractures of the lower jaw, as well as for wounds and other injuries of the under lip and chin. The method of applying it is mentiened in page 475.

Fig. 6. A bandage for ſupporting the head. It is formed by a proper appli-

cation of the double-headed roller, fig. 2. Plate XCV.

PLATE XCV.

[Oppoſite to page 476.]

Fig. 1. A common ſingle-headed roller; a bandage that anſwers for various purpoſes in ſurgery.

Fig. 2. A double-headed roller.

Fig. 3. A double-headed roller with a ſlit in the middle, forming what is termed the Uniting Bandage.

Fig. 4. A four-headed roller, uſually employed for fractures of the lower jaw and other affections of the contiguous parts.

Fig. 5. A bandage with twelve heads or tails applied to a leg. This, as we have had occaſion to obſerve in various parts of this work, is the moſt uſeful bandage for fractures, as well as for many other affections of the thighs and legs. In fig. 7. I have repreſented a bandage of the ſame kind, made in a manner

manner commonly uſed in ſome of the London hoſpitals.

Fig. 6. The uniting bandage, fig. 3. applied to a wound in the arm.

PLATE XCVI.

[Oppoſite to page 478.]

Fig. 1. and 2. A front and back view of the napkin and ſcapulary bandage; the moſt uſeful bandage for almoſt every part either of the thorax or abdomen. The particular parts of it, and mode of applying it, have been already deſcribed, page 478.

Figures 3. and 4. different forms of the T-bandage. This bandage proves particularly uſeful in affections of the anus and perineum. *C*, A hole for admitting the penis. At *D*, that part of the bandage which paſſes between the legs is divided into two; one part of it paſſing on one ſide of the penis and ſcrotum, and the other on the oppoſite ſide.

PLATE XCVII.

[Oppoſite to page 480.]

In this Plate I have delineated the different forms of ſuſpenſory bandages for the ſcrotum. They may be made either of linen, cotton, or flannel; but ſoft cotton anſwers beſt.

Each bandage conſiſts of a circular *A*, which is fixed round the body above the bones of the pelvis, and a pouch or bag connected with this: The principal difference between them conſiſts in the form of the pouch, and in the manner by which it is fixed to the circular. In figures 1. 2. 3. and 4. the pouch is connected with the circular both before and behind. Of theſe, fig. 3. I think is the beſt.

Where the ſcrotum is of ſuch a ſize, that the pouch or bag, when fixed upon it, will remain, the two bands, which paſs between the thighs for fixing it behind, are unneceſſary: Fig. 5. repreſents a form of it for this purpoſe.

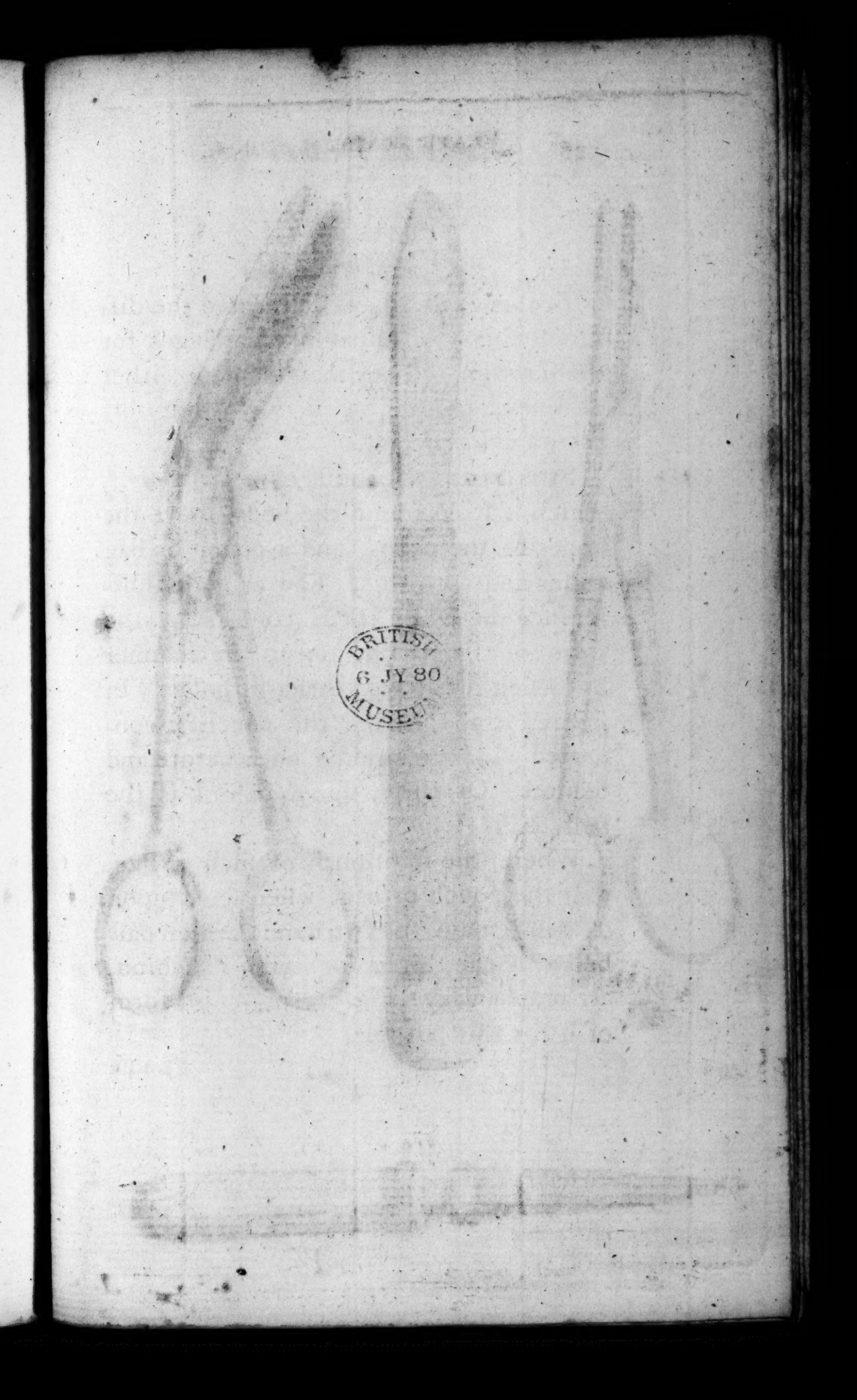

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PLATE XCVIII.

FIG. 1.

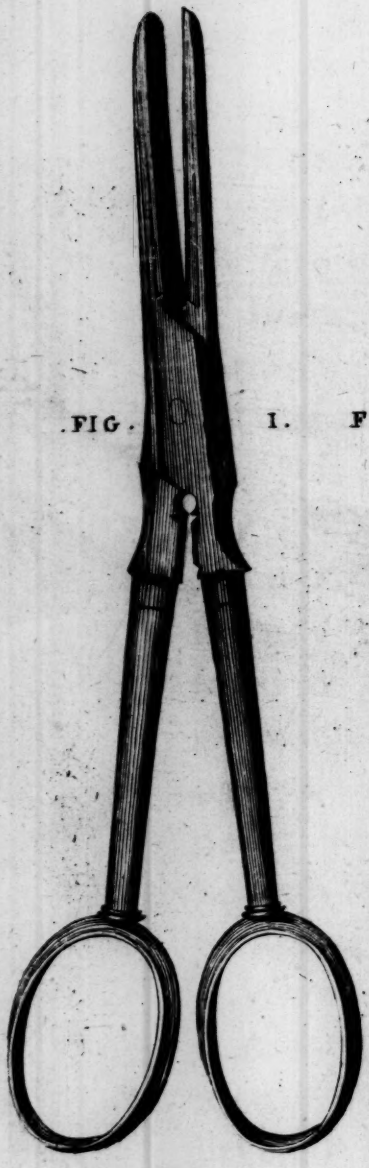


FIG. 2.



FIG. 3.

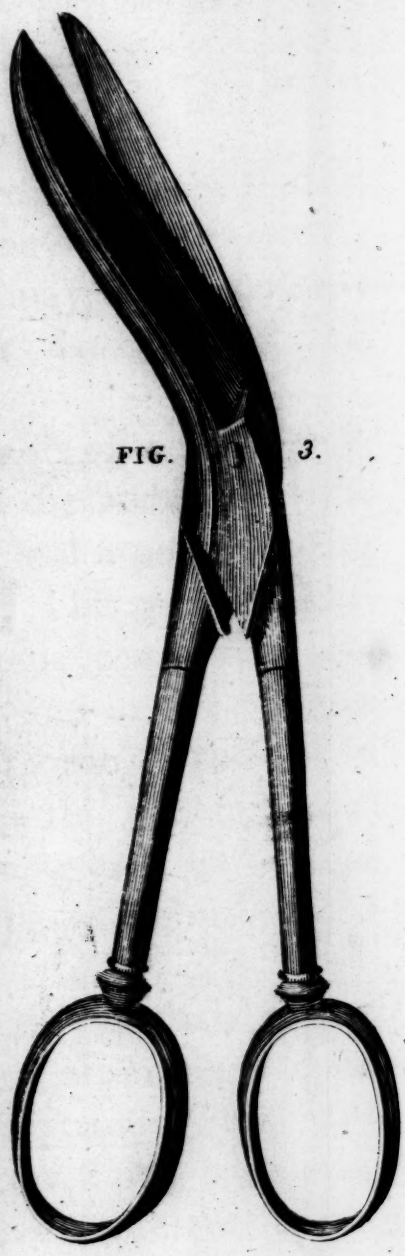


FIG. 4.



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PLATE XCIX.



FIG. 1.

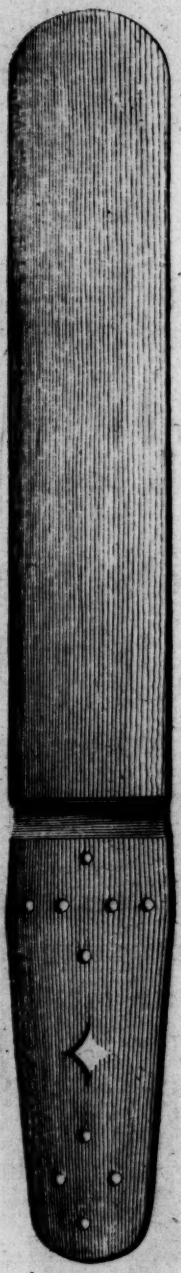


FIG. 2.



FIG. 3.

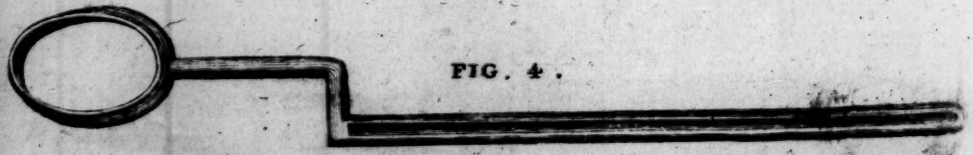


FIG. 4.

PLATES XCVIII. and XCIX.

[Oppoſite to pages 528. and 529.]

In theſe two Plates I have delineated inſtruments for a pocket-caſe, which ſurgeons have daily occaſion for.

PLATE XCVIII. fig. 1. Forceps. Fig. 2. A round edged ſcalpel. Fig. 3. Crooked ſciſſars. Fig. 4. A caſe for cauſtic and red precipitate.

PLATE XCIX. fig. 1. and 3. Different forms of probes. Fig. 2. A ſpatula. Fig. 4. A director.

Theſe, with a probe-pointed biſtoury, fig. 2. Plate VII. a tenaculum, Plate I. fig. 1. a ſcarificator, Plate XLIX. fig. 4. and a few crooked needles of different ſizes, form a very complete ſet for a pocket-caſe.

FINIS.

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ERRATA.

Page 81. line 2. for Plate LXXI. read Plate LXX.
86. line 18. for Plate LXXI. read Plate LXX.
96. line 5. for Plate LXXI. read Plate LXX.
117. line 15. for Plate LXXIII. read Plate LXXV.
207. line 4. for Plate LXXXIV. read Plate LXXXVIII.

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